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N.A.A. BULLETIN

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December 1959

In Two Sections
Section 1

Leases on the Balance Sheet

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Depreciation of Group Assets

•

Dollar Value "Lifo"

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Accountant's vs. Economist's Concepts of Break-Even Analysis

by ROBERT M. SOLDOFSKY

BREAK-EVEN ANALYSIS has been called a ". . . common ground for the economist and the cost accountant." (J. H. Kempster, *N.A.C.A. Bulletin,* February 15, 1949) True, break-even analysis is a common ground for economists and cost accountants, but its topography is characterized by a remarkably large number of pitfalls. Although the geology of this common ground is identical for both groups of specialists, the lenses of each profession filter out the view of one set of traps while they bring the other set into sharper focus. This article maps the common ground with the hope of guiding both the amateur and professional explorers through the area. A not so recent article (Ned Chopin, "The Development of the Break Even Chart: A Bibliographical Note", *Journal of Business,* April, 1955) traces break-even charts back to the work of two engineers, Knoeppel and Hess, in the first decade of the twentieth century and perhaps somewhat earlier. The economic bases for drawing break-even charts are clearly set forth in Alfred Marshall's *Principles of Economics,* published in 1880. However, attempts to make the differences between the accountant's and economist's understanding of break-even analysis explicit are of relatively recent origin.

Deceptive Resemblance Between Accountant's and Economist's B-E Chart

The upper panel of Exhibit 1 is a typical specimen of a device that has come into widespread use by management during the past twenty years. The lower panel is derived from the upper panel by dividing the cost and revenue functions by the output. Both panels show the same information; the upper presents this information in terms of total costs and revenues and the lower in terms of unit costs and revenues. The break-even point is 300 units per

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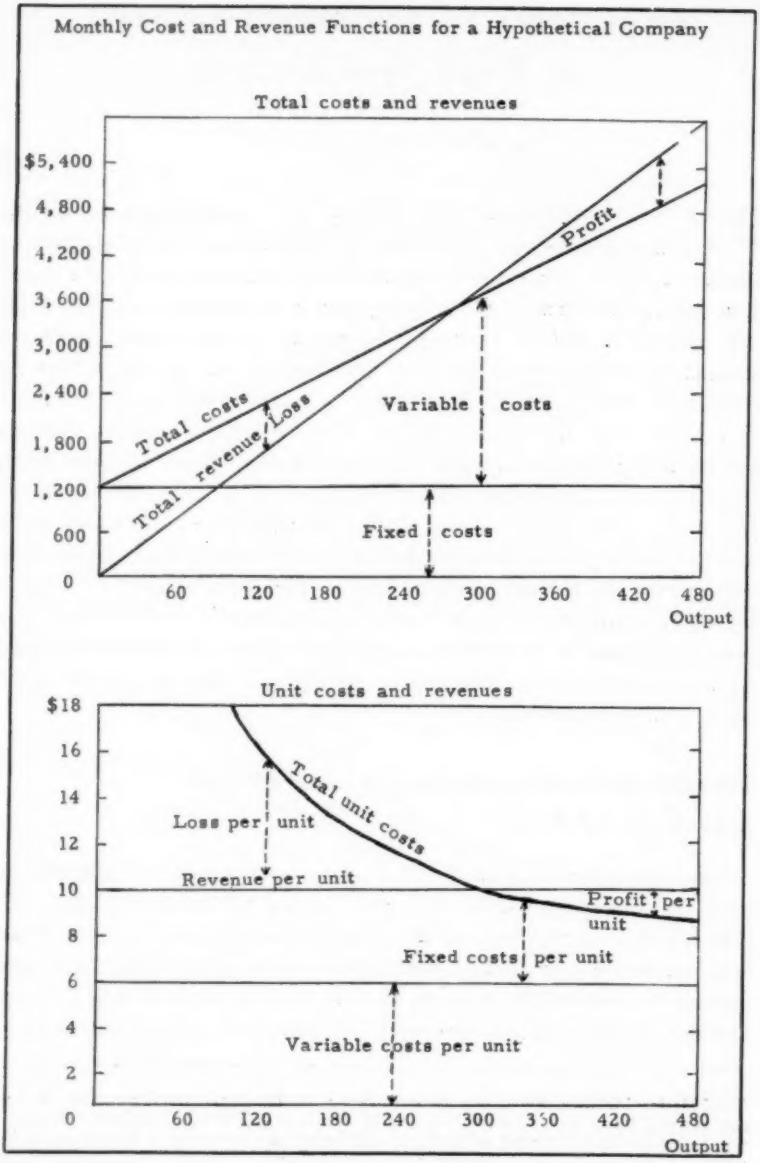
Monthly Cost and Revenue Functions for a Hypothetical Company
Total costs and revenues
$5,400
4,800
4,200
3,600
3,000
2,400
1,800
1,200
600
0
Profit
Total costs
Total revenue
Loss
Variable costs
Fixed costs
60
120
180
240
300
360
420
480
Output
Unit costs and revenues
$18
16
14
12
10
8
6
4
2
0
Total unit costs
Loss per unit
Revenue per unit
Profit per unit
Fixed costs per unit
Variable costs per unit
60
120
180
240
300
360
420
480
Output

EXHIBIT 1

month in both. The lower panel is deceptively similar in appearance to devices used by economists in describing the equilibrium output of the firm. The break-even charts used for illustrative purposes in cost accounting texts, monographs on profit control, and journal articles are almost always based upon the assumption that variable costs are constant per unit of output.

The typical break-even chart is similar to the upper panel of Exhibit 1 but may appear to be more complex when the fixed costs and the variable costs are broken down into subclassifications. For example, variable expenses may be classified as direct material, direct labor, and variable overhead. Some break-even charts identify not only the zero profit output but also the outputs at which the dividends on preferred stock and dividends on common stock are earned. Other break-even charts include a separate scale that shows the rate of profit on net sales. However, there is almost no discussion of the assumption that variable costs change by a constant amount per unit of change in the output. Nevertheless, the shape of empirical cost curves is the continuing subject of heated controversies among economists specializing in cost studies. There have been dishearteningly few published studies of cost curves. Most of these studies indicate that variable costs tend to be constant within the meaningful and relevant range of output. It should be recognized that these studies of empirical cost curves themselves are challenged.

Some Points of Difference

Break-even charts are powerful tools that help management analyze quickly the profit effect of past changes and the probable profit effect of future changes in output, revenues, and costs. This analytical tool will be of greatest service to those managers who are fully aware of the differences in the objectives, concepts, and data built into the break-even chart as it is constructed and used by accountants and economists. The differences in the concept of "profit" are a case in point. One dimension of this difference is due to the fact that the accountant and internal revenue code identify the return to the owners of a business as "profit". In the case of a corporation the "net income" reported on the statement of income and expense is identified as "profit". Zero net income on a statement of income and expense would appear as zero profit at the break-even point on a break-even chart. It is pointed out later in this paper that the economist defines profit as a remainder after accounting for *all* costs. One of the costs of business is the cost of the money-capital which is supplied in the form of equity funds by the owners. In so far as "net income" in the accounting statement excludes the cost of equity funds from the itemized

expenses, the business firm is sustaining an economic loss at the zero profit position or break-even point. The decision to undertake a contract at a price at which the firm will just break even in accounting terms is a decision to sustain an economic loss. The principal objective of this paper is to make differences of this type between economic and accounting concepts explicit. To the extent that this objective is achieved, communication in a fundamental sense between accountants and economists will be improved.

A primary objective of the economic theorist who is concerned with the demand and cost functions is the study of the allocation of resources within the individual firm and among all productive units. The techniques of economic analysis have been developed largely as a part of the quest to "explain" the mechanism of resource allocation and changes in the level of economic activity. These techniques have not been designed to be useful in the decision-making process of the individual firm. The demand curves and cost curves used in the economist's model of the firm are clear-cut concepts but generally lack empirical content. A basic question that must be discussed is whether the revenue curves and cost curves used in break-even analysis, even when they are based upon accounting records and projections, are built upon the same concepts as the demand curves and cost curves used in the economist's model. The answer suggested by this paper is that these concepts are different. The differences on the cost side are more numerous and more likely to deceive both the amateur and professional explorer.

The orientation of accounting is toward an accurate reporting of the past within the limitations imposed by outside agencies and the administrative requirements of the business. Business decisions, like all decisions, are oriented toward the future. An important problem for the firm is the method or technique by means of which accounting information can be made useful to business managers who are trying to increase "profits". The break-even chart is a dramatic way of summarizing past performance and of calling attention to areas of satisfactory and unsatisfactory performance. It should be emphasized that accounting reports are only one source of information for management. Production reports, for example, often identify problems before they are pointed out in break-even charts and other accounting reports. Once the problem area is identified, management will be concerned with the usefulness of the break-even chart built upon accounting data to help in evaluating alternative courses of action. In projecting future costs and selling prices accounting data should be used only after a very careful analysis in order to facilitate the preparation of projections that are relevant to the future policies and objectives of the

business. The break-even chart is only one among many techniques that may be used in evaluating alternative courses of action. The realization of the limitations of the break-even chart is important in the decision-making process. Perhaps the lack of wholehearted acceptance of the break-even chart in the decision-making process stems, at least in part, from a realization of these limitations. The substitution of economic concepts with appropriate empirical content, as far as that is possible or worthwhile, would enhance the usefulness of the break-even chart.

The economist working with his abstract model of the firm focuses his attention upon economizing the use of resources. The business manager and the accountant must consider a wide range of problems and policies. An adequate solution to one problem often conflicts with the solution of another problem. For example, the change from the straight-line method of depreciating fixed assets to the sum-of-the-years digits method, in order to economize cash in a growing firm, has the effect of increasing recorded expenses and decreasing net income. Such changes in accounting practices, even though they are well conceived, tend to reduce the confidence of top management and others in the accounting reports and forecasts as a measure of past performance and probable future performance.

Areas of Agreement

Before describing the differences between accounting and economic concepts more fully, the points on which there is common agreement should be made clear. The economist and accountant both require accuracy of detail. The accurate determination of net income sought by both groups implies that revenues and expenses are accounted for on an accrual basis. Revenue or income is earned at the time a sale is made, not necessarily at the moment or moments payment is received. Similarly, costs assigned to a given period of time must be correctly related to the revenue for the same period if the difference between revenue and expense is intended to represent the profit or loss for the period. Elementary economic analysis does not usually confront the problems of matching revenues and expenses but assumes that the revenues and expenses attributed to one period of time are properly matched. Any other assumption would not result in a figure that could be identified as the profit or loss for the period. Accountants and economists both desire a sharp cut-off point between periods of time for record keeping. They also agree on the ideal of making clear-cut distinctions between asset items and expense items.

Differences in the Use of the Revenue Curve

In describing the differences between the concepts underlying the use of data in the accountants' and economists' versions of a break-even chart, it is convenient to start with revenue. The revenue curve in the lower panel of Exhibit 1 looks like the familiar demand curve facing the firm under the conditions of pure competition. When the business unit sells an insignificant proportion of the total output of a homogenous product it can sell all of its output at the market price and nothing at any price above the market; that is, the demand for the product is perfectly elastic as seen by the firm. Under any alternative market position, the firm can increase its sales volume only by lowering its selling price when all other determinants of demand remain unchanged. In other words, the demand curve slopes downward toward the right when the seller has any degree of monopolistic control over price. The sloping demand curve implies that for each possible selling price there is a corresponding sales volume. As a matter of fact, the business firm generally cannot predict its sales volume so neatly on the basis of the selling price it sets. The revenue curve in the lower panel in Exhibit 1 is drawn for a firm that does have some control over the price it charges. The firm may select either a higher or lower selling price. At a higher price, sales will decrease but management probably does not know how much they will decrease. At a lower price, sales will probably increase, but management probably does not know how much they will increase. The management realizes that it cannot accurately forecast sales volume at the price selected or at any other price within a reasonable range. As long as the present selling price holds out the promise of satisfactory profits, a change in the selling price is not likely. Management may prefer to increase volume by such means as advertising rather than by changing the selling price.

The sales volume at a given price for a given period of time defines the point of intersection of the demand curve and the revenue curve. The revenue curve may be thought of as the locus of all points or outputs at a single price for an infinitely large family of demand curves. In Exhibit 2, D represents a series of demand curves and R is a revenue curve of the type used in break-even analysis. The quantity sold, C, marks the intersection of the demand and revenue curves. An increase in the quantity sold without a change in price is represented in economic theory as an increase in demand (a shift from demand curve to a higher curve which lies above and to the right). In break-even analysis, such a change is seen as simply a movement to the right along a given revenue curve. A change in price would result in a shift of the entire revenue curve in break-even analysis but could possibly be a movement along

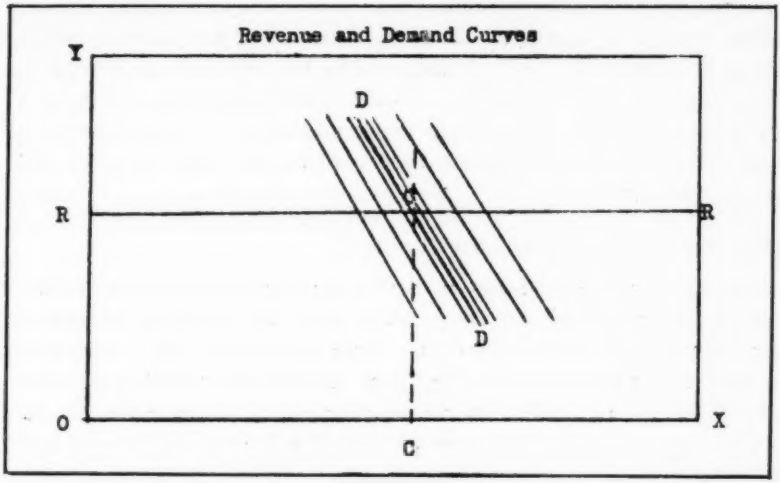

EXHIBIT 2

a given demand curve in the traditional sense. The business firm uses this revenue curve because it usually forecasts in terms of an unchanging selling price for its planning period. Although the firm cannot be certain of its sales volume, it may have an accurate measure of the probable range within which sales will fall. The selling price may remain unchanged for weeks or months, or even longer. During such a period of time the demand for the product of the firm may change. However, for a wide range of businesses, a change in price usually is not a practicable alternative to rising (or falling) volume or profit. In many other industries, prices are adjusted infrequently and then only as the result of very strong pressures. Under these circumstances, changes in volume and the consequent changes in costs and profits as they are highlighted by the break-even chart are of most interest to the top levels of management.

There is another reasonable view of the relationship between the revenue curve and the demand curve. The precise position and shape of the demand curve is an empirical, not a conceptual problem. Neither the economist nor the business manager knows the exact position and slope of the demand curve. Refined techniques and experience permit management to estimate the probable range of sales volumes for a range of possible selling prices. The probable range of output at a given selling price represented by the revenue curve simply indicates that an empirical statement of the quantity that will be sold at a given price does not have the precision implied by the geometrical model

of a demand curve. Once the selling price is fixed, the sales volume achieved defines one point on the demand curve. The selling price selected within the range of reasonable choice is influenced by such objectives as maintaining or increasing the firm's share of the market. (This is not to say that price is the only or even most important element in maintaining or increasing a firm's share of the market. The market price selected and the objectives sought will also be reflected in costs.)

Differences in the Use of Cost Curves

The cost curves used in break-even analysis are usually short-run cost curves—costs for the period of time during which plant and equipment are fixed in the context of the theory of the firm. There are many significant differences between cost curves as used in break-even analysis and as used in economic theory. Some eleven differences are suggested below and there are probably others. Not all of these differences are applicable in every case: two of them are largely a matter of administrative convenience and necessity; six more are a matter of empirical content; two of the remaining ones are basic differences between the accounting and economic concepts of cost; the final difference relates to objectives. This classification is arbitrary and, therefore, readily subject to criticism. The reader may be able to impose an alternative classification upon these eleven differences that is more useful for his purposes. The reader may also be able to add to the number of differences between the accountant's and economist's concepts of costs.

In break-even analysis and in budgeting practices generally, some costs are held constant for the planning period. For example, advertising expense may be at higher or lower levels. Most advertising expense is not a function of output. From the point of view of the management, sales and output are some function of advertising. It takes time for the impact of an advertising program to be felt, assuming that its impact can be isolated and measured at all. At any time during the period that the budget is being used, the advertising budget may be changed by management. It should also be noted that there is no unique relationship between advertising expense and sales. The same amount spent on advertising but spent on different advertising copy, spent in different advertising media, etc., may result in a different volume of sales without a change in the selling price. In economic theory both fixed and variable costs are usually thought of as being related to the transformation of input into output. Advertising expense is incurred in order to affect the quantity of the product sold, the selling price, or both; it is not a part of the transformation costs.

For the analysis of the short-run equilibrium output of the firm, it is usually assumed in economic theory that the prices of the input factors are constant and the techniques of production remain unchanged. Any change in either of these variables would signal the end of one period and the start of another. In break-even analysis the relevant period of time is the budget period. Most businesses that have formal budgets prepare these budgets for one year by months. During the budget year, the prices of inputs and production techniques may both change, but such changes usually do not result in the preparation of new budgets. In so far as possible, the annual budget will reflect known and forecast changes in the prices of inputs and the techniques of production. For example, one of the major automobile firms builds the known cost of the annual improvement factor and the probable cost of the cost-of-living escalator clause in its labor contracts into its budgets.

It is certainly more convenient for the firm to develop budgets and break-even charts on an annual basis rather than to prepare separate budgets and break-even charts for each known or probable change. The custom of preparing annual budgets rather than budgets for the shorter periods indicated by economic analysis could be interpreted in several ways. It might indicate that small and continuing changes in such variables as the prices of inputs or techniques of production are relatively unimportant in business decisions. It might also indicate that the problem-solving uses of break-even charts developed upon the basis of accounting data are not important in the decision-making process. Data obtained by management from other than accounting records and reports are, in many instances, more helpful than accounting data in arriving at decisions. Many other interpretations of the differences in the time dimension of break-even charts based upon accounting data and those used in economic analysis are possible. These differences may be thought of as being merely a matter of convenience, but they also seem to point toward differences in the outlook and objectives of economists and accountants.

The Empirical Differences

As has been indicated, six of the differences between the cost curves used in economic analysis and break-even analysis can be discussed under the heading of empirical content. The economic theorist is concerned with the development of the concept of cost itself, the relationship between cost and output, and the relationship between costs and revenues.

First, the cost curves used by accountants in break-even charts are generally not carefully determined by means of statistical methods but developed quickly

and not critically enough from accounting and engineering data. Such inaccurate cost curves lead to faulty identification and analysis of aspects of good and poor performance. These inaccuracies may be the result of such things as an improper allocation between fixed and variable costs, improper allocation of costs among the individual classes of fixed or variable costs, themselves, improper allocation of costs between departments or products, and so on. The economist generally has no problem, because his cost curves may be thought of as being correct by definition. The cost projections in the economist's model are correct because perfect knowledge is normally assumed.

Second, the correct identification of fixed and variable costs is important for both break-even analysis and economic analysis. The criteria for determining which costs are fixed and which are variable may differ for economists and accountants because of difference in outlook and because of the complexities of wrestling with real rather than hypothetical data. Different accountants and different accounting systems would rarely make the same allocation of cost between direct and indirect labor in the same case. The allocation of all indirect costs among products and departments is influenced by arbitrary decisions which are often motivated by purposes other than an accurate allocation. The amount and allocation of such costs as depreciation and maintenance through time are readily affected by managerial decisions.

Time Allocation and Efficiency Basis Reflect Different Concepts

The third empirical difference relates to the assignment of costs to individual periods of time. The cost curves of elementary economic theory are static or timeless so that the economist seldom confronts the problem of assigning revenues and costs to individual periods of time. The correct assignment of revenue and costs to accounting periods is a major and continuing concern of the accountant. The duration of the accounting period is determined by administrative considerations and convention; the duration of the period of time between individual moments selected for analysis by the economist is usually determined by events that are important in the study of resource allocation. In the process of assigning revenue and costs to individual periods of time, the accountant has a considerable range of discretion. Such discretion is permitted or provided for by business policy, accounting theory, and the internal revenue code. The economist would be very likely to view one and only one specific assignment of revenue and cost to an individual period of time as being correct on the basis of his concept of cost and his objective.

Fourth, the short-run cost curve of economic theory usually assumes absolute or maximum efficiency in the use of the factors of production. Within the limitations of the existing technique and the equipment of the firm, the cost curve used in break-even analysis is the representation of what either exists or is planned. The projected cost curves may forecast perpetuation of existing inefficiencies.

Fifth, in the cost curves used in elementary economic analysis, one of the normal assumptions is that the firm produces one absolutely uniform product. The cost curve used in practice may represent several varieties of the same product, such as different sizes or different price lines, or it may represent different products. Economic analysis can effectively deal with multiple products but would probably hold the product mix constant for the period being studied. Although economic analysis is capable of analyzing the mechanism of resource allocation when multiple products are involved, the exposition is more complex and, therefore, it is used less frequently for illustrative or pedagogical purposes. The chances are that the product mix for a business enterprise selling multiple products has not been constant in previous accounting periods and will not be constant in future periods. Nevertheless, break-even analysis seems to proceed upon the assumption that changes in the product mix during the accounting or budgeting period do not seriously or significantly limit the meaningfulness of the analysis.

Sixth, the last and most bizarre of the empirical differences discussed here, results from the existence of improvement or learning curves. Learning curves are of greatest importance in forecasting the costs of production of airframes, other heavy equipment that is mass produced, and specialized military equipment. The learning curve exists because the whole organization "learns" how to produce the product. Both direct and indirect costs per unit of output decrease as an exponential function of the *total* number of units produced. The impact of the learning curve on the cost per unit of output diminishes with each successive unit produced until it becomes very small. In industries in which learning curves are found, break-even charts built upon accounting and engineering data incorporate the effect of learning curves on the revenue and cost. To date, economic analysis has given very little consideration to learning curves and their significance for resource allocation.

Costs Are Differently Defined, Dated . . . and Presented

Two of the differences between the cost curves used in economic analysis and in break-even analysis are based upon fundamental differences in concepts.

First, the economist defines cost to include all elements of cost, but some of these costs are regularly excluded as costs from the accountant's statement of costs. This is universally true of the cost of money-capital which is supplied in the form of equity funds by the owners. The return to the owners is largely interest, as measured by the rate that the owners could earn by employing their funds in alternative opportunities that present equal risk. Profit, as the economist defines it, is an analytical category that is of greatest use in describing the mechanism that leads toward the efficient allocation of resources. For smaller firms the accounting statement of costs may not even include an adequate return to the owner for his services as either a laborer, manager, or both. The second fundamental difference is concerned with the dating of the costs. In economic theory costs are all measured in terms of current or alternative costs. In accounting theory and practice, costs are measured in terms of the prices at which the factors of production are originally purchased. The continuing controversy with respect to the pricing of inventory and the material included in the cost of goods sold is very well known. In so far as the last-in, first-out method of computing cost of goods sold approximates current cost more closely than the other methods, it would also approximate the requirements of economic analysis more closely.

The greatest difference between the economic and accounting concepts of cost due to the criteria for dating costs occurs in the pricing of the services of depreciable assets such as machinery. Not only is the historical cost of the machine spread arbitrarily over the life of the asset but, as the replacement price of the machine changes (assuming replacement with an identical unit), no adjustment is made in the periodic depreciation charge in order to adjust historical cost to current cost. The doctrine of historical costs is embodied in the income tax code and in accounting postulates. When the prices of depreciable assets are rising, the result is that depreciation in terms of current cost is understated and net income is overstated. To the extent that "net income" is overstated, the "income tax" is in reality a capital consumption tax. Many businessmen understand that decisions with respect to alternative courses of action should be based upon current cost. As long as accounting data is framed in terms of historical costs and the price level as well as the structure of relative prices is changing, the usefulness of accounting data in the decision-making process is limited.

The final difference, to be presented here, between accountants and economists is based upon their criterion for selecting between alternative statements of cost. For example, if the tax law permits depreciation to be taken on several different bases, the accountant is most likely to select (or be directed to

select) the method that will minimize current tax payments. The economist's objective of economizing the use of resources can be achieved only if costs are measured in terms of the current value of the flow of services into the output of the product. His models are not influenced by what the tax laws permit or by other aspects of business expediency.

Useful and Simple — But May Be Misleading

Although the technique under discussion is called "break-even analysis", it was described in the introduction as a method of depicting graphically the relationships between output, revenue, costs, and profits. The break-even chart is helpful in visualizing the probable effects of an increase in selling price associated with an increase in costs. The usefulness of the technique would be limited if attention were directed entirely to profit as developed in the forecast. The businessman does not view his costs, prices, and output as rigid elements that he must accept and cannot change even if he wishes to do so. He believes that costs, prices, output, and profit may be affected by the actions he takes. On the basis of such a device, he may be able to understand more clearly the possible consequences of his decisions.

Another important use of the break-even device may be suggested. If a large manufacturer is planning the mass marketing of a new product, he will use market research to estimate the approximate price level at which he will be able to achieve volume sales. The engineering and production departments will be called upon to engineer the product and design the manufacturing process to keep the cost down to a point at which the manufacturer will be reasonably assured of a profit within the probable range of volume. If the initial estimate of the costs is too high relative to the probable selling price and volume, the designing process may be continued until such time as the product is believed to be economically feasible or is given up.

The break-even chart may also be used to forecast the effect upon profit of increases or decreases in the selling price which are independent of the fixed costs or variable cost functions. Specific uses for break-even charts most frequently mentioned by business executives are: (1) to establish output level and profit goals, (2) to review price policies, (3) to establish normal volume level for burden rates and budgeting, (4) to help in guiding facility usage and new investment decisions, and (5) to aid in the selection of product lines.

The break-even chart is simple to read, deceptively so for those who do not understand its construction or limitations. The data used in it are usually obtained from accounting records, budgets, and other readily available sources

which may not be subjected to a sufficiently critical analysis before being used. The cost and revenue curves are greatly different from those used in discussions of the short-run, static model of the firm in elementary economic analysis. The use of accounting data and forecasts in accounting terms as though they were data developed on the basis of economic concepts for the purpose of economic analysis is, at best, unwise. Actions based upon such analysis could be disastrous for a business unit.

Business managers do not passively accept the effects of circumstances upon their revenues, costs, and volume. With this knowledge, they are able to take more effective steps to influence these variables in the desired direction. Break-even analysis will be helpful in showing graphically the results of events that have taken place or in demonstrating the probable effect of events that may or will occur. The break-even chart is probably most helpful in its ability to show clearly the effect of any change in prices, costs and volume on profit. The effect of volume upon profits as shown in the break-even chart may be used to communicate effectively within the firm. The break-even chart will help to economize the time of heavily burdened executives. Of course, the results achieved by use of this device depend upon the type and quality of the information used. Inaccurate or inappropriate data leads to inaccurate forecasts; there is no mechanical device that can overcome this handicap. Any analysis of resource allocation attempted by an economist upon the basis of the data used by a business for the purpose of break-even analysis is very likely to be misleading.

Divisionalization, Decentralization — and Return on Investment

by GORDON SHILLINGLAW

ONE OF THE MOST INTERESTING DEVELOPMENTS in managerial accounting practice in recent years has been the growing use of periodic reports of divisional return on investment or return on capital employed. Much of the work that has been done in divisional profit measurement has been hampered by unquestioning application of techniques originally developed for product cost-finding. The resulting return on investment figures are difficult to interpret and may stimulate management behavior that is at odds with the company's best interests. This paper is designed to examine some of the problems in return on investment measurement and to make a few suggestions for improvement. Specifically, the proposal is to reflect the controllability criterion in cost and investment allocations and to extend the flexible budget concept to return on investment evaluation.

As a means of discussing this problem, I should like to deal in turn with four aspects of return on investment measures:

1. The organization structure underlying the problem.
2. Objectives of return on investment reporting.
3. Accounting concepts that may be applied to measuring return on investment.
4. The development of return on investment standards.

Organization Structure in the Large Corporation

Delegation of authority in the large corporation is essential to prevent top management from being buried under a mass of detail. The diversity of operations encompassed by a single firm requires both trained specialists to deal with technical problems and a greater number of executives whose outlook is broad enough to coordinate the activities of the specialists. In addition, corporate

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size requires what amounts to a bureaucracy to subdivide the work into units of manageable size. The span of control of any one executive limits the number of people whom he can supervise effectively, the number varying with the complexity of the operations being performed and the caliber of the personnel.

The concepts of departmentalization, divisionalization and decentralization have been developed to cope with these problems. The principles of departmentalization have long been understood, but it is only recently that serious attempts have been made to sort out the problems of divisionalization and decentralization and arrive at some logical principles upon which to base the implementation of these concepts.

Divisionalization

The most important bases for divisionalization are the product line, the geographical area, and the business function performed. The method adopted may be partly a matter of conscious choice, it may be dictated by obvious economies in one kind of structure, or it may depend on the method used by the company to achieve its growth. For example, General Motors' divisionalization largely follows the paterns set by the previously independent firms that were merged to form and expand the company. Divisionalization at the Ford Motor Company, in contrast, was achieved by a conscious effort to break up the previously centralized organization structure. Divisionalization in the brewing industry generally follows the regional patterns established by high transportation costs.

A sound program of divisionalization must provide clear, unambiguous definitions of four major elements of the divisional structure:

1. The boundaries within which each division is free to operate without interference from other divisions, and the relations that are to exist between divisions.
2. The scope of each division manager's decision-making authority and responsibility, and his relationship to top management.
3. The criteria by which each division manager should be guided in making decisions on matters that fall within his jurisdiction.
4. The measures that will be used to evaluate the performance of each division manager in carrying out his responsibilities.

The establishment of divisional *boundaries* is easiest in a functional organization, but there are problems, too. For example, production and sales are the responsibilities of the manufacturing and sales divisions, respectively, but further specification is necessary to determine whether the manufacturing division can

solicit outside business directly to utilize idle capacity or whether the sales division is allowed to purchase products from outside suppliers and under what conditions. Product division limits are frequently harder to trace, particularly if the divisions do business with each other or compete directly with each other in product markets. The boundary question may be settled partly by manageagement's answer to the problem of selecting the amount and kinds of decision-making authority that is to be delegated to the division managers. For example, does the sales vice president have the authority to carry out changes in the product line on his own initiative or is this a matter that requires top management approval? In a strictly functional organization, authority is seldom delegated on questions that cut across functional lines and require a coordinated appraisal of profitability. Even in a regional or product-based organization, the authority of the division managers may be severely limited. The actual amount of delegation depends on management's philosophy as to the role which division management is expected to play in the overall direction of the company's activities.

The *criteria* that are selected to guide division managers in the decision-making process must be consistent with the decision-making *authority* delegated to the divisions. A manufacturing division manager should not be expected to base his production decisions on their effects on profits unless he is also granted authority to influence sales volume. Divisional criteria should also be consistent with the criteria that would be applied by top management to the same decisions. One of the main difficulties in a functional organization is that the guides to divisional decision-making must necessarily be considerably narrower than top management's profit criteria. The manufacturing vice president is expected to satisfy production demands at least cost. The sales manager is asked to maximize his gross margin while keeping his selling and distribution costs within specified limits. Evaluation of alternatives in terms of their effects on total company profits is reserved for top management. Decision-making criteria for product division or regional division managers are likely to be broader than those applicable to functional divisions, assuming that the product or regional division incorporates its own manufacturing facilities as well as its distribution facilities. Specifically, they are likely to be profit criteria, the same criteria by which top management is guided. The question then becomes one of defining profit and of insuring that application of the divisional profit criteria will lead to decisions that will be consistent with the application of similar criteria on the corporate level.

This question is closely intertwined with the selection of *performance evaluation* measures. Managerial performance has many dimensions which can never

be expressed in a single figure without considerable oversimplification. The accountant's task is not to measure performance in all its aspects but merely to present a periodic report on the financial aspects of the manager's stewardship of the facilities and activities entrusted to him.

The most important consideration in selecting the measure of financial performance is whether an improvement in divisional performance shown on the periodic reports also represents an improvement in overall company profit. Division managers cannot avoid being guided in their daily decisions by the effect of these decisions on the division's performance report. Therefore, if profit is to be the division manager's guide in decision-making, then the profit performance measure should reflect the effects of these decisions on total company profit, at least in direction if not in the exact absolute amount.

Decentralization

The logical successor to divisionalization along product or regional lines is decentralization. The two differ largely in management's point of view and in the amount of authority delegated to the division managers. Decentralization aims to recreate in the large organization the conditions that give life and flexibility to the small company without sacrificing the advantages of size—diversification of risk, centralized financing and specialization in the planning and advisory functions. To carry out this philosophy, authority is delegated to the division manager to set his own prices, select his sources of supply and choose his own customers, subject to certain limitations set forth in general company policies. Accompanying this delegation of authority is a parallel delegation of responsibility, a responsibility for profit. Under these conditions, the division may properly be called a profit center, a unit that is operated substantially as an independent company within the boundaries set by the company policies and the grant of authority that created the division.

Although some companies have been able to decentralize within the framework of a functional organization structure, most decentralization is the outgrowth of dissatisfaction with the ability of functional divisions to satisfy management's need to delegate decision-making authority. The main problem is to find criteria for decision-making that are consistent with the criteria that would be applied by top management. In a functionally organized company, only top management has the information and the breadth of outlook that are necessary to evaluate operations in terms of profits. Division managers are one step removed from the effects of their decisions on corporate profits. Unable to take into consideration the various factors which govern profits, they are forced to

use cost or sales volume as guides to decision-making. For this reason top management finds it too dangerous to delegate much of its decision-making authority and is increasingly burdened by the weight of its own decision-making responsibility. Furthermore, functional divisionalization tends to breed executive specialists who get to see operations in a broad profit perspective only after they have been promoted to top management ranks, when mistakes and errors in judgment cover broader segments of the company's business and, therefore, are likely to be more costly.

Divisionalization on the basis of product lines, geographical areas or customer groups generally incorporates in each division some responsibility for two or more functions. This makes decentralization easier, but it does not guarantee that the division will be operated as a profit center. Effective decentralization requires that division executives be granted the authority to control profit performance. It also means that divisional profit figures should be designed to reflect the effectiveness of the division managers in maintaining or increasing total company profit. One of the main problems in decentralization is to secure for each division a substantial degree of autonomy, and this can be made possible only if a reliable index of profit performance can be obtained.

Organization structure, of course, cannot be determined by this goal alone. Other factors, such as economies of common use of sales forces or manufacturing facilities, may override the desirability of separating profit centers from each other. In these circumstances, the problem is to seek means of measurement and evaluation that will achieve a satisfactory compromise between conflicting objectives. The remainder of this paper will be devoted to a study of one of these problems, the problem of developing a satisfactory means of evaluating the profit performance of division executives.

Return on Investment Reporting — and Measurement Problems

Broadly speaking, there are two objectives that management may have in mind when setting up a system for measuring the profit return on divisional investment. The first of these is to secure a summary measure of the profitability of the operations, products and facilities that are encompassed by each division. The second is to obtain information as to how well the various division managers are conducting their portions of the company's activities.

At first glance, these objectives may appear to be quite similar. In fact, they are very different. Evaluation of the profitability of an activity may be either historical or forward-looking. From a historical point of view, management wants to know whether past investments in the division have been adequately

profitable. At the corporate level, total company profits can be related to the amount of funds invested in the business in the form of a return on investment ratio. Comparisons among companies in this regard provide some indication of their relative effectiveness in utilizing capital funds. Management would like to apply this same concept to various segments of the company to identify the areas in which their investment decisions have been most productive.

Although this approach has a certain limited usefulness, decisions as to future investment in specific areas must be made from a different viewpoint. The historical return on investment ratios, for example, do not provide the answer to the question of whether the division's activities should be abandoned. What is wanted here is a relationship between the present disposable value of the facilities and the probable future earnings that would be lost if the division were to be abandoned. Are these future earnings sufficient to justify the continued tie-up of the investment which could be realized by sale of the facilities and release of working capital, plus any additional outlays that would have to be made to achieve the projected earnings stream? Data relevant to decisions of this sort cannot be derived exclusively from routine historical performance reports; they must consider the probable effects of the decisions on future flows of cash into and out of the firm, including any effects on other segments of the company. For this purpose historical division profit data are clearly inapplicable.

The personal evaluation of the performance of the division manager is quite a different story. The ability of the division manager to produce profits is limited by conditions of the market, by the scope of the authority delegated to him, and by the historical background of the operations and facilities that fall within his jurisdiction. His performance should be evaluated in terms of his success in producing profits within these constraints. The conditions under which division managers must operate are too diverse to permit evaluation by a simple comparison of their respective return on investment ratios. Instead, what is wanted is a comparison of actual profit performance with some standard of desired performance, tailored to the environment in which the division manager must operate. Both the measure of performance and the standard against which it is to be compared must reflect the degree of control that the division manager can exert on profit and investment. This makes the task of developing meaningful return on investment reports considerably more difficult than it would be if only some historical indicator of the profitability of the facilities were desired.

Once managerial performance evaluation is recognized as the primary objective of routine divisional control reports, we can turn to the role that return on investment should play in these reports. Return on investment is defined as the ratio of reported profit to some measure of capital employed. The problem

is to determine how these elements are to be measured. What items are to be included in divisional investment, for example, and at what dollar value? How should divisional profit be defined? Although it is not possible in this short space to examine all of these questions in full detail, it will be helpful to study four points:

1. The definition of invested capital.
2. The effects of price level fluctuations.
3. The allocation of costs and assets.
4. The interdependence of divisional profits.

Definition of Invested Capital

The common stockholder normally thinks of invested capital as the amount he has paid for his stock, or the amount for which he could sell it on the market, or perhaps the amount shown as net worth on the company's balance sheet. The bondholder's definition of invested capital is similarly narrow. For the measurement of divisional investment, however, a more inclusive definition is necessary. There is no distinction between debt and equity in the funds provided to a division. Division management is entrusted with a portion of the company's total permanent capital, which consists of both debt and equity, and this capital is expected to earn a return. It means that invested capital cannot be defined as net worth, because this overlooks the investment of the company's long-term creditors. The invested capital might be defined as total assets minus interest-free current liabilities, reflecting the total capital provided specifically in the expectation of a monetary return, or it might be defined as total assets. The spread between these two measures may be large or small, but the choice can generally be made on the basis of convenience. Little serious objection can be offered to taking the definition most frequently used, total assets employed.

Another question of definition is whether physical property is to be stated at its gross amount or net after depreciation. The widely publicized duPont chart system utilizes the gross assets approach, largely on the ground that the deduction of depreciation allowances destroys comparability among divisions and between successive time periods. Thus one division with an older property mix has a lower net asset base than a relatively new division with new plant and equipment. The net asset base of a given division rises or falls depending on whether new investments exceed or fall short of current additions to the depreciation allowance.

The choice between gross and net property will depend in part on the relationship between the age of the property and its earning power. If age has no influence on earning power, the gross base provides a more reliable base for identifying variations in earning power due to other causes. But, if earning power declines with age, the use of gross assets tends to penalize older facilities by relating declining earnings to a constant base. The fact is that both gross assets and net assets are imperfect measures of the economic value of plant and equipment. Earning power generally is not impervious to age, but the assumption that it declines in proportion to net book value is equally hard to defend.

It might easily be argued that this question of definition is not really very important. The purpose of the return on investment ratio is to provide a means of comparison with some desired ratio. This comparison is not designed to judge the profitability of the facilities or even of the products or operations to which they are devoted—these purposes are better served by other measures which depart from the historical records and the routine profit performance reports. Instead, what the return on investment ratio is designed to do is to provide a measure of the effectiveness with which the manager is utilizing the resources at his command. If the standard of comparison is permitted to fluctuate from period to period, the problem of defining the investment base recedes in significance. If a constant standard is to be imposed, then the choice between gross and net property base should probably depend on which method is more likely to produce a constant book return on investment each year during the life of the facilities.

Effects of Price Level Fluctuations

Price level fluctuations are a second cause of difficulty in measurement. After a period of inflation, long-life property is a mixture of assets acquired at substantially different price levels. Divisions with an older asset mix will have a lower historical cost investment base than younger divisions and also lower depreciation charges. This introduces some distortions into interdivision comparisons and even greater distortions into interperiod comparisons for a single division.

Indexes of price level changes could be used to restate asset values and depreciation charges in dollars of comparable size, but the value of this step is open to question. Again, we must remember that it is managerial performance that we wish to appraise with the aid of return on investment ratios and not the profitability of the activity itself. The profitability of an activity might very well

be appraised in terms of some uniform desired return on investment, but managerial performance standards can be adjusted to meet individual situations. Only if a constant, uniform standard for return on investment is to be applied is it necessary to adjust for the effect of price levels on divisional property investment and depreciation charges.

The effect of price level changes on inventory values is somewhat more serious. No matter what method of inventory valuation is in use, changes in price levels will exert some influence on the return on investment ratio. During most years, "lifo" valuation will reduce the profit effect of price level gains or losses, but it will lead to an undervaluation of the investment base. "Fifo" inventories will approximate current replacement cost, but reported profit will include some price level effect. In contrast to property investments, short-period changes in physical inventories may be relatively large and may be subject to a greater degree of control by the division managers. These changes in physical inventories should be reflected in the divisional investment base, but changes that result from the inventory valuation method tend to obscure physical changes and should be minimized. One solution to this problem is to use up-to-date standard prices for inventory valuation and to remove price variances from divisional profits. This provides a meaningful measure of the division's commitment of company funds to inventories and produces a profit figure that is not subject to fluctuations in the prices paid for materials, supplies and labor services. In the absence of standard costs, index numbers or some other means of adjustment should be used to offset the effects of historical cost inventory valuation.

Allocation of Costs and Assets

Thus far, we have been considering factors which affect company-wide financial statements as well as divisional statements. Perhaps the most difficult problem in measuring divisional return on investment, a problem that is not encountered at the level of the enterprise as a whole, is posed by the existence of centrally administered assets and central office costs.

Centrally administered assets include not only the physical facilities provided for head office use, but also other items such as cash, receivables and inventories which are present because of the operations of the various divisions but which, for various reasons, are administered centrally. The size of the asset balances required responds to the operations of the various divisions but this response is considerably obscured. For example, the cash balance required to handle cash flows smoothly in an independent company is probably greater than the balance required when the same operation is part of a larger financial entity. Further-

more, the effect of the operations of a division on corporate cash balances cannot be completely isolated. Even if all other transactions could be traced to divisions, cash withdrawals by central management for dividends and debt service cannot be assigned to divisions without the use of some arbitrary rule of thumb.

The crux of the problem is not so much the difficulty of tracing centrally administered assets to divisions, although this may be a difficult task. Rather, it is the inability of the division managers to control central office asset balances. If the division manager has no control over asset balances, the return on investment ratio will be a poorer reflection of the manager's performance if the investment base is allowed to fluctuate with changes in these balances.

Most of the commonly used allocation methods fail to meet this requirement. Centrally administered current assets are assigned to divisions on the basis of some ratio to sales or other index of activity. The ratio may be predetermined or it may merely represent the overall ratio of current assets to sales for the company as a whole in a particular reporting period. These methods, unfortunately, assume a proportionality between asset balances and activity that may not exist. Much of the recent research in inventory requirements, for example, indicates that an increase in sales can be handled by a less than proportional increase in inventory balances. Similar relationships exist for cash balances. For receivables, proportional relationships with sales volume are probably valid for individual classes of customers or products but, if divisions differ materially either in the ratio of credit sales to cash sales or in the terms of sale, different ratios will have to be used for each profit center.

Another difficulty of these percentage allocation methods is that they have the effect of assigning to the division manager a responsibility for controlling the level of assets without giving him the authority to carry out this responsibility and without reflecting the success or failure of any control that he may be able to exert. The amount charged to the division manager fluctuates with the volume of his activity. The actual amount of cash, receivables and inventories attributable to his division may be fluctuating in a far different pattern.

The solution to this problem may have more than one dimension. First, any centrally administered assets that can be readily traced to a division and that can also be controlled by the division manager should be charged at their actual amounts. For example, if central warehousing permits economies in storage costs, finished products may be transferred by divisions to central office inventory accounts identified by divisions. If inventory levels are controlled by the head office, then fluctuations in inventories should not be reflected in the divisional investment base. On the other hand, if inventory control is a divisional re-

sponsibility, then any changes in inventory levels should be reflected in the divisional statements.

Any centrally administered assets that either cannot be traced to divisions or are not subject to control by the division managers should receive different treatment. One possibility is to make no allocation at all. This would satisfy the requirement of return on investment reporting for managerial performance evaluation, but it would understate the investment base for historical profitability review. An alternative to no allocation is to distribute these centrally administered and centrally controlled assets to divisions, according to some budget formula. Any assets allocated in this fashion would be excluded from the investment base for managerial performance evaluation but could be included in the historical profitability ratios. In fact, if the amount allocated is completely predetermined, then the division manager's asset budget could reflect this and no distortion of the managerial performance evaluation would result. This gets us into the question of setting evaluation standards, a question to which we shall return in a moment.

Allocation problems are not restricted to the investment base, however. Just as we have centrally administered assets, we also have many centrally administered costs. The question of cost allocation is an extremely broad one, but a few general comments may serve to throw some light on the problem as it relates to measuring divisional return on investment.

At the outset, we must recognize that the absolute level of divisional profit and, therefore, of return on investment can never be determined. Many central office costs are truly common costs in that they are incurred to enable all divisions to carry out their operations. These costs would not be materially different if the division were to vanish into thin air. This means that any method of allocation is bound to be arbitrary. This being the case, such allocations are of no relevance in determining the level of divisional performance and of no help in comparing the relative performance of different divisions. These allocations, if they are to be made at all, should be made on either of two bases or perhaps a combination of the two. To the extent that the level of these costs is unaffected either by the volume of activity in the individual divisions or by their demands for service, central office costs should be allocated to divisions as a lump sum determined in advance. If these costs or portions of them vary either in response to the volume of activity or in the volume of service demand, however, either the full costs or the variable portion of them may be allocated to the divisions at a predetermined rate or price times the index of activity or demand in the profit center. Thus, if there is a central engineering department the services of which are used jointly by many divisions, the cost of the engineering depart-

ment could be allocated on the basis of a fixed price per hour of service. There is no reason why all of the engineering personnel have to be charged at the same rate, but the rates should be fixed in advance to avoid distortions due to fluctuations in the total volume of service demanded by all divisions and the efficiency with which the service department is operated.

No matter what method of allocation is used, the important thing is to produce divisional profit figures that reflect as adequately as possible the degree of control that the division manager is able to exert. Predetermined lump sums presume no controllability. The use of predetermined rates presupposes a controllability over quantities but not over cost per unit of quantity. Only if the division manager's control extends to prices as well as quantities should full actual costs be used in allocation and, if this is the case, then direct departmental charges rather than allocations are to be preferred.

Interdependence of Divisional Profits

One final set of questions arises because of the interdependence of divisional profits. Divisions frequently transfer goods or services to other divisions. The prices at which these transfers are recorded can influence the level of divisional profit and also the inventory component of the investment base. Interdependence also exists between successive time periods for any one division. Supplies and indirect manufacturing materials, for example, may be charged to expense either at the time of purchase or at the time that they are issued from inventory. To the extent that unrecorded inventories of these items fluctuate, currently recognized expense will be an inadequate reflection of current operating costs. This particular problem is unlikely to be serious for periods as long as one year, but, for monthly or even quarterly reporting, they will influence the absolute level of profits and return on investment. Maintenance costs fall into the same category, although the time required to average these out is likely to be considerably longer insofar as maintenance expenditures may be deferred or advanced at management's discretion.

One of the most serious objections that has been leveled at the entire concept of the profit evaluation of managerial performance is that the divisional profit figures are capable of substantial short-period juggling of these time-shiftable costs. It must be admitted that this problem has not been completely solved. Some central administration of such items as maintenance is probably required, but the degree of central interference in divisional affairs is an extremely ticklish problem. Perhaps the best weapon that top management has is its authority to review and modify divisional budgets, but this is not a complete solution to

the problem. What this points out, of course, is that the evaluation of managerial performance has many dimensions and that no single figure, return on investment or otherwise, is enough in itself.

Returning for a moment to the transfer price problem, many companies have been highly successful in applying transfer price systems that are based on market prices. In some cases, there is room for negotiation between division managers whenever market prices are not sufficiently reliable. Nevertheless, there are many instances in which market-based transfer prices are completely inapplicable and some other device must be sought. In such cases, both the profit measure and the standard of comparison should be selected to reflect the degree of control that the division managers can exert over internal transfers and the prices at which these transfers are made.

Return on Investment Standards

The most crucial issue in return on investment reporting is the selection of standards. Standards for evaluating return on investment performance cannot be set without a clear conception of the purpose of the evaluation. For historical review of the aggregate effectiveness of past investments in a division, some constant, uniform standard is probably adequate. The major problem here arises from the allocation of centrally administered assets and central office costs. These allocations may be made even though the division managers have no direct control over the amount of investment or cost. Generally speaking, it must be recognized that such allocations are at least partly arbitrary and that some deviation from standard may be the result of the allocation methods rather than the operations of the division. Price level fluctuations also introduce distortions into the return on investment figures.

In any event, the purpose of these historical comparisons is severely limited. This means that a fairly substantial error range can be tolerated. Standards for this purpose can be obtained from analysis of the published financial statements of competing limited-line companies, from historical analysis of the company's own financial statements, or from estimates of the average cost of the capital funds employed in the company as a whole. The cost-of-capital standard is perhaps the best of these in that it reflects the price demanded for the use of their money by the company's owners and long-term creditors but, since no decisions will be made solely on the basis of this historical evaluation, the choice of the standard is probably of little importance.

Standards for use in investment decisions must be framed with considerably greater care. Here the question is whether new investment or continued tie-up

of funds in a particular division will produce an adequate return in the future. Adequate return should be determined with reference to the demands of owners and creditors for a return on the funds they are providing to the firm, in other words, the cost of capital. The cost of capital is difficult to measure, but it should reflect the relationships between the market prices of the company's securities and the future stream of earnings on these securities. The historical return on historical investment ratio is of little assistance in determining cost of capital. For example, the fact that a railroad has succeeded in earning only two percent on its assets in the past does not mean that two percent is an adequate return on investment. Nor does the fact that an electronics firm has been able to earn thirty percent on its net investment necessarily mean that investors demand a thirty percent return on future investments.

But these are not the main objectives of return on investment reporting. To repeat, the principal objective is to provide a measure of the performance of the division manager in working with the factors over which he has some measure of control. For this purpose the standard should be adjusted both to the degree of controllability and to the conditions under which the division manager has been operating.

Flexible Evaluation Standards

Most return on investment systems recognize inherent differences in profitability among divisions. This is commendable, but it does not go far enough. The nature of the product line is not the only external determinant of profitability. Just as we apply the flexible budget technique to the control of manufacturing costs, we might apply varying profit standards to individual divisions, depending on the level of their operations. This means that we are not only interested in having the division manager increase his return on investment. We are also interested in having him meet or better standards of what constitutes a reasonable return on investment for the volume of business which he is doing. Unless we turn to something of this sort, we are faced with a situation in which an increase in profit and return on investment which results from a substantial increase in sales volume is always regarded as favorable performance by a division manager, even though, with the increased sales volume achieved, he should have been able to increase his profit and return on investment still more. What is needed is some way of judging what the profit should have been at the new sales volume. This can be achieved only by an extension of the flexible budget technique into the matter of setting profit standards.

The variable profit standard is not without its shortcomings, however, and

it is unlikely that it will ever replace the fixed planning budget entirely as a tool of performance evaluation. Volume has many dimensions. Profit depends on selling prices and product mix as well as physical volume. Flexible profit budgets that assume constant product prices may inhibit price reductions that would increase overall return on investment. This means that both the fixed planning budget and the flexible budget must be included in the evaluation of divisional profit. The basic standard remains the planning budget. Deviations from planned profit can be examined, with the aid of the flexible profit budget and other data, to isolate the effects of price changes, changes in product mix or other variables.

Even so, the most important aspect of this scheme is its emphasis on budgeted profit or even budgeted rate of return instead of some less flexible profit standard. The evaluation standard must reflect each division's operating environment. Company-wide or historical standards, useful as they may be for other purposes, have little relevance to managerial performance evaluation. Allocation methods should be selected to produce as little distortion as possible in performance reports, largely by eliminating noncontrollable variances in these items. This shift in emphasis from historical ratio comparisons to budget variance analysis should make the divisional profit report a better tool for control, both by introducing profit standards that are more alibi-proof and by eliminating from the evaluation base items over which the divisional executive has little or no control. The only major requirements are a soundly conceived budgeting system, with considerable participation by division management, and rational methods of allocating (or not allocating) costs and assets.

Digest of N.A.A. Research Report No. 35

Return on Capital as a Guide to Managerial Decisions

Presented below is a digest of findings in the N.A.A. Research Study dealing with return on capital as a guide to managerial decisions. Members of the Association who wish a copy of the full report may obtain one copy without charge on request to the National Headquarters Office. A convenient order card will be mailed to you in a few days for this purpose. Copies of the report are also available to non-members at $2.50 each. Members may obtain additional copies at the same price.

A FEW COMPANIES have long used rate of return on capital as a guide to management for reviewing past performance and for appraising proposed plans and projects. In recent years, interest in rate of return as a management tool has spread rapidly. In the course of this development, different concepts of rate of return have appeared and numerous variations in methods for ascertaining and using rate of return are in use. The objective of this study was to review these concepts and methods and to evaluate them in terms of the purposes for which they are intended. Material presented in the report is drawn largely from field interviews with forty-four companies which use rate of return as a management tool.

Early in the study, it was evident that different practices in using rate of return on capital are not alternatives but, instead, they are different tools designed for different purposes. Uses for rate of return fall into the two basic categories briefly described below:

1. Measuring periodic profit performance under the profit responsibilities established by a company's organization plan. Here rate of return is determined by relating income of the period to capital employed during the same period of time.
2. Measuring anticipated rate of return from proposed projects such as acquisitions of a new plant, modernization of equipment, or replacement of a machine. Project rate of return is ascertained by relating anticipated income or savings to capital employed in the project.

Organization of the report follows the two major uses stated above.

Rate of Return for Measuring Periodic Profit Performance

Part I of the report consists of the following chapters: Determining the Capital Base on which Rate of Return Is Measured, Determining Income Related to Capital, Determining Return on Capital by Segments of a Company, Analyzing Changes in Return on Capital, and Return on Capital as a Guide in Pricing.

Where the purpose is to measure performance of operating management, capital is defined as assets placed at management's disposal. In the practice of the companies interviewed, somewhat different points of view exist as to how this definition should be applied and the following variations were evident.

1. Total capital available. Here rate of return is based on total assets entrusted to management's control regardless of the fact that some of the assets (e.g., construction in progress) may not be currently producing a return.
2. Total capital employed. This concept of a capital differs from the foregoing in that excess or idle assets are eliminated from the base on which rate of return is determined.
3. Capital employed in operations. Representing a somewhat narrower view of management's responsibility, this concept omits assets such as investments outside the business, current assets held to pay short term creditors, and similar items.

The more inclusive definitions are commonly used for computing rate of return for a company as a whole. Extension of broad concepts to segments such as divisions and products raises difficult problems in allocation of centralized assets. For this reason, such assets are sometimes omitted from the capital on which local management at the divisional or plant level is expected to earn a return. The study disclosed that rate of return is often determined on different bases within a single company because the relevant concept of capital differs with the scope of the profit responsibility for which performance is being appraised.

Questions also arise in stating the amount of capital represented by certain types of assets. For example, depreciable assets may be stated at gross cost or at current book value after deducting accumulated valuation allowances. The report states that reasoning seems to support the latter method more strongly, but a substantial body of practice was found on both sides of the issue. While the study disclosed widespread concern over the effect which inflation has had on rate of return data, very few of the companies have attempted to restate historical figures in terms of the current price level.

Where the purpose is to measure rate of return on capital invested in the

business by stockholders, capital is defined as the amount of stockholders' equity rather than as assets. The report suggests that more attention might be given to the relationship between rates of return on assets and on equity in order to reflect the effect of leverage in a company's financial structure.

Participants in the study generally agreed that the definition of income for determining rate of return should be consistent with the definition of capital employed for the same purpose.

Using Rate of Return in Capital Budgeting

Part II of the report includes the following chapters: The Financial Statement Method, The Discounted Cash Flow Method, Relationships Between Pay-Back Period and Rate of Return, Using Rate of Return in Decision Making. In addition, the report contains an appendix describing the use of tables for calculating rate of return by the discounted cash flow method.

Determining and using rate of return for evaluating projects involving new investment raises problems which are, in many respects, unlike the problems encountered in appraising past performance. The two different approaches which have been developed for measuring project rate of return are termed, in this report, the *financial statement method* and the *discounted cash flow method.*

Under the financial statement method, capital employed in a project and the related income are determined by methods used in accounting for assets and income. Rate of return is based on original investment or on average investment over the life of the project. Numerous variations exist in the application of this method and these different methods may yield materially different rates of return for the same project.

Under the discounted cash flow method, project rate of return is computed on the amount of capital unrecovered from period to period instead of upon the initial or average investment. Discounted cash flow rate of return is defined as the maximum rate of interest that could be paid for the capital employed over the life of the investment without loss on the project. The method for determining project rate of return is essentially the same as the method used to find the effective rate of interest on a bond selling at a discount or premium.

Rate of return by the discounted cash flow method is developed from cash flows identifiable with the project. Recognition is given to the time value of money by discounting the cash flows to a common point in time.

In comparing the financial statement and discounted cash flow methods, the report concludes that the financial statement method is easily understood by

persons acquainted with accounting statements and, when applied with judgment under appropriate conditions, it can be a useful tool to guide investment decisions. However, the discounted cash flow method seems to be superior in the following important respects:

1. The discounted cash flow method ascertains rate of return from cash flow data directly relevant to the project being evaluated while, in contrast, the financial statement method uses concepts of capital and income designed for the quite different purpose of accounting for periodic income and financial position. As a consequence, the financial statement method is affected by depreciation method, capitalization policy, and other accounting procedures which are irrelevant to the question at issue.

2. The discounted cash flow method correctly reflects the influence of such factors affecting rate of return as timing of cash flows and the impact of income taxes. On the other hand, the financial statement method gives no consideration to the time value of money and may not reflect differences in the influence of factors such as taxes.

3. The discounted cash flow rate of return is directly comparable with cost of capital as it is customarily quoted in the money market while rate of return determined by the financial statement method is not comparable with the cost of capital.

4. Once the basic method is understood, the discounted cash flow method is simpler to apply because it does not require so many decisions to be made in ascertaining the amounts of project investment and income, nor is skilled judgment needed to evaluate the influence which such decisions have on rate of return determined by the financial statement method.

5. In general, the correctness of a project rate of return figure can be tested by determining how long it would take to recover the investment if the project were financed by borrowing all of the needed capital at a rate of interest equal to the rate of return being tested. If the rate of return has been correctly determined, the period required to recover the investment will be equal to the life of the project. While a rate of return computed by the discounted cash flow method will pass this test, a rate computed by the financial statement method will rarely do so.

Conclusions

Whether carefully computed or roughly estimated, rate of return on capital is a significant and widely used guide to many types of decisions made by busi-

ness management. Practices of most companies participating in this study show that rate of return on capital is an important item in periodic financial reports to management at levels where responsibility for profits is carried. Return on capital is more extensively used for appraising past performance than for guiding decisions with respect to the future. With improvement in techniques currently used and education of personnel to make effective use of these techniques, return on capital offers a reliable financial guide in a wide variety of decisions.

Depreciation on Mass Properties— An Application of Statistical Concepts

by W. CHESTER FITCH

A CONTINUING CONTROL of depreciation charges depends upon the determination at periodic intervals of the proper amount of depreciation accumulated in the reserve. Such a determination can be made easily by estimating only two quantities: average service life and average remaining service life. Although single units of property require a re-evaluation of the estimate of service life and net salvage periodically, upon the retirement of the unit the amount of the total depreciation will be obvious and proper accounting entries will be forthcoming. In contrast, mass property accounts, containing a large number of similar kinds of equipment, are seldom terminated as a whole and, as a consequence, they are not subject to the periodic precise control of depreciation at the time of retirement. In addition to requiring a periodic revision of life estimates, the use of groups of units makes it impracticable to apply a direct age-life ratio as a measure of accumulated depreciation.

Accumulated Depreciation for Mass Properties Requires Statistical Approach

The acceptance of straight-line depreciation methods for single units is frequently attributed to the simplicity of the method. The analogous method for mass properties, applying a constant annual accrual rate to the average balance in the account, often referred to as group average service life straight-line method, has been endowed with this same simplicity in the minds of many people. Unfortunately, the simplicity of the unit method is not transferred to the group method. The computation of the annual accrual is reasonably easy, but the subsequent determination of the proper amount of the accumulated depreciation at any age is not subject to as simple an arithmetical determination as in the case of a unit.

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The combination of a number of units into a group requires the use of statistical concepts in the accounting for depreciation. An obvious necessary statistical measure is the *average* service life of the many units instead of the total life of a single unit. An immediate complicating factor in the use of this statistical measure is that the average service life of the *investment* in the units, not the life of the units, must be estimated. Whereas the life of the single unit and the investment in that unit are identical, the average of the lives weighted by the number of units will not generally equal the average life of the investment weighted in proportion to the cost of the units. A less obvious statistical concept influential in determining the amount of accumulated depreciation is the standard deviation or scattering of the retirements over a number of years. The skewness, or concentration of retirements early or late in the life of a group, also influences the size of the accumulated depreciation at particular ages, even though the standard deviation is the same.

Mortality Statistics Provides Simple Test Techniques

Mortality statistics, however, provide the techniques necessary to approximate the proper amount of the accumulated depreciation for mass property groups. By intelligent use of mortality or survivor curves—graphs of the number of percent surviving at successive ages—estimates can be made of the accumulated depreciation. Because the use of a calculated accumulation of depreciation based on appropriate methods should have wider financial acceptance and because current rate case usage should be based on a more perceptive approach, an explanation of a relatively simple current approach to approximating the size of an adequate depreciation accumulation using only average service life and average remaining life is presented as a means of control available to all. As current use of statistically calculated depreciation accumulations (reserves) is principally concentrated in public utility rate cases, the implications of a calculated reserve in this area are examined specifically.

The use of original cost (or a measure of value) in public utility regulation requires the adoption of some measure of annual and accrued depreciation. Two courses of action appear to be open: the books of the company can be accepted as final proof or some appropriate test can be made of the adequacy and consistency of the annual and accrued depreciation. The acceptance, on faith, of book annual and book accrued depreciation on the basis that the amounts shown on the books of the company are inviolable can in certain circumstances lead to unfair interplay between annual and accrued depreciation. Thus, various methods have been devised to test depreciation accumulations. These methods,

when applied to a single unit of property, have generally been used properly but, when used for groups of property or composite accounts, inaccurate methods based on the ratio of average age to average life have resulted in significant inequities. Any method of estimating accumulated depreciation should be compatible with the method used in accruing depreciation when such a method is in conformity with accepted practice. Otherwise, the fundamental purpose of depreciation, namely, the recoupment of the original cost through a systematic allocation of cost, will be abrogated, because the estimate of present depreciation, when added to future accruals obtained by the company's accepted method of accruing depreciation, will not equal original cost.

Few public utility commissions or other governmental agencies have authority to make or have exercised their right to make adequate studies to determine what the proper amount of accumulated depreciation may be. Many of these bodies have preferred to abstain from establishing or approving the magnitude of the reserves or the annual rates, except as they are used in a restrictive sense in the particular case. Thus, control of the size of depreciation accumulation remains the responsibility of the companies.

The policy of some companies of making annual depreciation allocations for general corporate purposes which differ widely from the depreciation expense allowed in a rate case or for tax purposes results in a situation which, at times, places a company in a position of defending two different actions concerning the same thing. As a result, the estimate of the annual depreciation on the income statement and depreciation accumulations on the balance sheet might be subject to question. Reasonable control techniques of comparable stature to the methods used for auditing other accounting areas would minimize the difference between various depreciation estimates while assuring an adequate rate of recoupment of fixed capital.

Deficiencies in the Control of Accumulated Depreciation for Property Groups

The adoption of a method of calculating depreciation is based on either stated or implied assumptions. Although numerous companies have presented reserve requirements or calculated reserves, there appears to be little concern over whether the calculations were based upon principles which are acceptable. As a result, the fundamental objectives and assumptions underlying the acceptance of a particular method of depreciation are ignored and superficial reasons are given for using a particular method. A discussion of this subject would require lengthy consideration of the objectives and principles involved in select-

ing a method of depreciation. As the group straight-line depreciation, using a constant rate, is one of the most often adopted methods of depreciating mass properties, this discussion is restricted to showing that the use of a ratio based on average remaining life and average service life can be used to approximate the accumulated depreciation resulting from such an accounting process.

It is of interest to contrast the control of the accumulated depreciation for a single unit with that for a group of units. If records are kept individually for ten adding machines with a depreciable original cost of $400 each and an estimated life of ten years, the proper accrued depreciation on *each* machine can be calculated at any age. Such accrued depreciation is equal to the product of the age, rate and cost, e.g., at age seven the accumulated depreciation is $7 \times 0.10 \times \$400 = \$280$. Thus, if one adding machine is retired after seven years of service, it is easy to see that $280 has been accrued, and that an adjustment of $120 is necessary. If a machine lasts twelve years and the accrual rate is 10 percent, it is unlikely that any accrual will be made after age ten. Some adjustment to the rates in this example might be made if careful control is maintained. Regardless of the frailties of the above example, the point to be made is that it is possible, when individual items are depreciated separately, to tell exactly whether the original cost of a particular item is recouped over its life. If, however, these ten adding machines had been considered a group and replacements were made continually, there would be no termination of the life of the group. Thus, exact control of the allocation and recoupment of the original cost of each unit at the time of retirement or of excessive accruals when the estimated life is exceeded is foregone if property units are grouped together. When average life is used to determine the rate, inadequate accruals on retirements prior to average life are balanced by continued accruals on property living beyond average life.

Unless the difference between an age to life ratio for a unit and an average-age to average-life ratio for a group is understood, grave errors of judgment can occur in administering group depreciation on the basis of the average age of the property in service. To provide a sound basis for judging the propriety of the accumulated amount, a method of calculating accrued depreciation is available which, by substituting average remaining life expectancy for age, results in a proper consideration of age and group characteristics. To estimate the proper size of the accumulation requires that proper weight be given to the following: the age and average life of the surviving property, the magnitude and the time of occurrence of the accounting entries increasing or reducing the accumulation, growth of the property, and the effect of transfers and other activity. The basis for the estimates of the influence of these factors

must be experience, modified by known factors which may influence future retirements. Thus, the adoption of group accounting has made the control of depreciation much more complex, since it requires that estimates include a combination of the aforementioned factors. These estimates can be based on a systematic study of personal opinion or statistical mortality studies augmented by judgment.

Statistical Estimates vs. Accounting Methods

The purpose of statistical methods of estimating the accumulated depreciation is to provide an estimate incorporating these several variables based upon the past retirements, probable future retirements, the magnitude and time of the occurrence of past and future retirements, the growth of the depreciable group, cost of removal and salvage. Mortality studies provide a means of summarizing historical experience as a guide to the estimation of average service life and survivor pattern of a property group. Although of less reliability, these estimates can be made without mortality studies. Once the basic estimates of average service life, net salvage and survivor pattern are made, with or without formalized statistics, the calculation of the estimated accumulated depreciation is a direct process and the results of the calculation should not be modified by intuition.

The following discussion will show by exposition, by algebra, and by example that an arithmetical method using only an estimate of average service life and remaining life expectancy exists which produces estimates of accumulated depreciation identical with the result which is obtained by the normal accounting methods, if used under identical circumstances. In addition, it is shown that, for group properties, the age to life ratio is an erroneous measure of accrued depreciation. For those not mathematically inclined, the equivalence of the accounting method, using a constant rate, and the graphical method, using a ratio of remaining life to average life, can be visualized by interrelating the following statements concerning the accounting method and the statements describing the graphical representation of the remaining depreciable investment (the original cost less net salvage) from a single year's installations:

THE CONVENTIONAL MASS ACCOUNTING METHOD

A–1 Annual depreciation accrual = (annual accrual rate) × (average annual investment)

A–2 Book accumulation = sum of past accruals less past retirements

A–3 Percent accumulated depreciation (percent reserve)

$$= \frac{\$ \text{ accumulated depreciation as of a date}}{\$ \text{ remaining depreciable investment as of that date}} \times 100$$

A–4 If the accumulated book depreciation is adequate at any time, it is equal to the depreciable investment surviving, less future accruals from that time to the end of the life of the group.

A GRAPHICAL METHOD USING LIFE ESTIMATES

G–1 The surviving investment is represented by plotting the dollars remaining at the beginning of each year versus age. This is called a survivor curve (Exhibit 1).

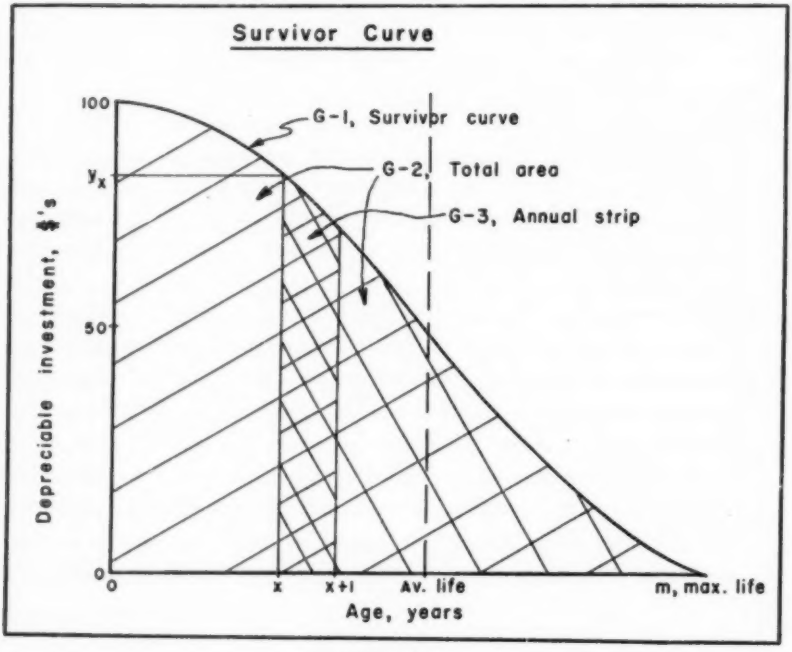

EXHIBIT 1

G–2 The total area under such a survivor curve is equal to the dollar-years of service rendered by all of the units in a single year's installation. The total area divided by the investment at age zero is the *average life*. When this sum of the areas beyond any age is divided by the surviving investment at that age, the result is defined as the *average remaining life*.

G–3 The annual accrual rate is the reciprocal of the average life. Each annual strip of area is equal to the average height of the bounding lines, which is equivalent to the average investment during that year. (Compare with A–1).

G–4 Since the sum of the areas of the annual strips from age zero to any age is equivalent to the sum of the average investments to that age, when this area is multiplied by the accrual rate, the sum of the past accruals results. As the annual accrual rate is equal to the reciprocal of the average life, the accumulated reserve can be determined directly from a graph of surviving investment by dividing the area under the curve from age zero to age x by the average life and subtracting the total retirements, the initial investment less the surviving investment. (Compare with A–2).

G–5 The sum of the areas of all annual strips beyond any age is equal to the sum of the future average balances. When such a sum is multiplied by the annual accrual rate, this represents an estimate of the sum of the future accruals.

G–6 The sum of the areas of the annual strips from any age to the maximum life of the group is equal to the sum of the future average investments. When this sum is multiplied by the annual accrual rate, the result is the total of the future accruals. When the sum of the future average investments is divided by the surviving investment, the average remaining life is obtained. Thus, it follows that, when the remaining life is expressed as a percent of the average life and is subtracted from 100 percent, the percentage of accumulated depreciation is determined.

G–7 Therefore, the adequacy (compare with A–4) of an accumulation based on expected events at any age can be evaluated either by estimating from the graph the surviving investment at any age and subtracting the sum of the future accruals found in G–5, or by estimating the average remaining life and average life and using the relationship explained in G–6.

A more systematic proof of the equivalence of the two estimates of accrued depreciation can be obtained by writing the above series of statements in algebraic form.

MATHEMATICAL PROOF OF THE EQUIVALENCE OF ACCUMULATED DEPRECIATION USING THE MASS ACCOUNTING METHOD AND USING THE MATHEMATICAL AVERAGE REMAINING LIFE FUNCTION

$x =$ any age of the group.

$m =$ the age when the last unit of the group is retired.

y_x = depreciable investment surviving at age x.

y_{x+1} = depreciable investment surviving one year later at age x + 1.

y_0 = depreciable original investment of group at age zero.

$y_0 - y_x$ = total retirements to age x.

L = average life.

$$\text{Annual accrual rate} = \frac{1}{\text{average life}} = \frac{1}{L}$$

The average service life is equal to the total area under the curve in Exhibit 1 divided by the depreciable original investment at age zero. The average remaining life is equal to the double cross-hatched area in Exhibit 1 under the survivor curve from age x to m, divided by the surviving investment at age x.

Accumulation Based on Past Accruals and Past Retirements

P-1, Annual accrual = $\left[\frac{y_x + y_{x+1}}{2}\right]\left[\frac{1}{L}\right]$

P-2, Total accruals from age 0 to age x = $\sum_0^x \left[\frac{y_x + y_{x+1}}{2}\right]\left[\frac{1}{L}\right]$

but, $\sum_0^x \left[\frac{y_x + y_{x+1}}{2}\right]$ = Area under survivor curve from age 0 to x

and, $\frac{1}{L} = \frac{\text{Depreciable original cost at age zero}}{\text{Area under entire survivor curve from age 0 to m}}$

P-3, Total calculated accumulation = total accruals - total retirements =

$$\left\{\sum_0^x \left[\frac{y_x + y_{x+1}}{2}\right]\left[\frac{1}{L}\right]\right\} - \left\{y_0 - y_x\right\} = \left\{[\text{Area from 0 to x}]\left[\frac{y_0}{\text{Area from 0 to m}}\right]\right\} - \left\{y_0 + y_x =\right\}$$

$$y_x + y_0\left[\frac{\text{Area from 0 to x}}{\text{Area from 0 to m}} - 1\right] = y_x - y_0\left[1 - \frac{\text{Area from 0 to x}}{\text{Area from 0 to m}}\right] =$$

$$y_x - y_0\left[\frac{\text{Area from x to m}}{\text{Area from 0 to m}}\right]$$

P-4, Ratio of accumulated depreciation to remaining book cost =

$$\frac{y_x}{y_x} - \frac{y_0}{y_x}\left[\frac{\text{Area from x to m}}{\text{Area from 0 to m}}\right] = 1 - \left[\frac{y_0}{\text{Area from 0 to m}}\right]\left[\frac{\text{Area from x to m}}{y_x}\right]$$

P-5, (A-3 and P-4 in terms of life)

$$\text{Average life} = \frac{\text{Area from 0 to m}}{y_0} \text{ and, Average remaining life} = \frac{\text{Area from x to m}}{y_x}$$

yields

$$1 - \left[\frac{1}{\text{Average life}}\right]\text{[Average remaining life]}$$

EXHIBIT 2

The ratio of the past accruals less the retirements from age zero to any age x to the surviving investments (Exhibit 2) is equal to

$$1 - \frac{\text{average remaining life at age x}}{\text{average life}}$$

Accumulation Based on Future Accrual and Surviving Cost

F-1, Annual accrual = $[\frac{y_x + y_{x+1}}{2}]\ [\frac{1}{L}]$

F-2, Total accruals from age x to age m = $\sum_{x}^{m} [\frac{y_x + y_{x+1}}{2}]\ [\frac{1}{L}]$

Since L is a constant, the total accruals from age x to age m = $\frac{1}{L} \sum_{x}^{m} [\frac{y_x + y_{x+1}}{2}]$

F-3, An adequate amount of accumulated depreciation from F-2 = $y_x - [\frac{1}{L}] \sum_{x}^{m} [\frac{y_x + y_{x+1}}{2}]$

F-4, Per cent accumulated depreciation of surviving investment = $1 - [\frac{1}{L}] \sum_{x}^{m} [\frac{y_x + y_{x+1}}{2y_x}]$

F-5, (in terms of life estimates)

Since $\sum_{x}^{m} [\frac{y_x + y_{x+1}}{2}]\ [\frac{1}{y_x}]$ is the average remaining life expectancy,

F-4 can be reduced to $1 - \frac{\text{Average remaining life expectancy}}{\text{Average life}}$

EXHIBIT 3

Therefore, the ratio of the difference between the sum of the future accruals and the surviving original cost to the surviving original cost which has been shown (Exhibit 3) to be:

$$1 - \frac{\text{average remaining life expectancy}}{\text{average life}}$$

is the same ratio as that obtained in the previous development based on past accruals (Exhibit 2). Thus, when the actual average life and the known survivor characteristic are used (these are available only after a group is completely retired), the ratio of accumulated depreciation to the surviving original cost at any age, expressed in terms of average and remaining life, is the same, whether developed by using the accounting method from age zero at the beginning of the group to any age x or by using the accounting method from age x to maximum life.

When the average service life is used for current depreciation purposes, the estimate of the actual average life includes an estimate of the remaining life expectancy which implies an estimate of the future retirement or survivor pat-

tern. Thus, when considering the adequacy of an accumulation of depreciation, it is logical to recognize such judgment of adequacy as a process of estimating the future accruals. In addition, to establish reasonable estimates of the annual rates, a test of adequacy is available by using the ratio 1 — expectancy/average life applied to the survivors of every year of installation.

Comparisons of the results of book entries using past estimates will seldom agree with estimates based on current estimates of life. Such deviations are not necessarily an indication of improper estimates; rather they may indicate the variation between the estimate of life and the actual life, just as any estimate based on a sample is known to deviate from the true population statistic.

Equivalent Results

Another illustration that the percent accumulated depreciation developed

Calculation of Annual and Accumulated Depreciation

Date	Original cost balance	Annual accrual, cr. for year ending	Annual retirements dr. for year ending	Balance of accumulation at date	Accounting ratio, accumulation to survivors at date
1-1-40	$1,000.00	$	$	$	0.000
12-31-40	980.00	182.32	20.00	162.32	0.166
12-31-41	950.00	177.71	30.00	310.03	0.326
12-31-42	860.00	166.66	90.00	386.69	0.450
12-31-43	740.00	147.33	120.00	414.02	0.560
12-31-44	570.00	120.63	170.00	364.65	0.640
12-31-45	300.00	88.40	180.00	273.05	0.700
12-31-46	250.00	58.93	140.00	191.98	0.768
12-31-47	130.00	34.99	120.00	106.97	0.823
12-31-48	60.00	17.50	70.00	54.47	0.908
12-31-49	0.00	5.53	60.00	0.00	1.000*
		$1,000.00	$1,000.00		

Average life (obtained by calculating the total dollar years of service and dividing by the initial $1,000):

$$\frac{(20)(\frac{1}{2}) + (30)(1\frac{1}{2}) + (90)(2\frac{1}{2}) + \ldots + (60)(9\frac{1}{2})}{1000} = 5.43$$

$$\text{Annual accrual rate} = \frac{1}{5.43} = 0.18416$$

$$\text{The first annual accrual} = \frac{1000 + 980}{2} \times 0.18416 = \$182.32$$

Ratio of accumulated depreciation to surviving cost = Column (5) ÷ Column (2)

*In the limit.

EXHIBIT 4

Calculation of Per Cent Accumulated Depreciation
Using Life Estimates

Date	Age	Ratio of age to life	Area* to right of x	Expectancy at age x	Accumulation ratio** at age x
1-1-40	0	0.000	5430	5.4300	0.000
12-31-40	1	0.188	4440	4.5306	0.166
12-31-41	2	0.368	3475	3.6579	0.326
12-31-42	3	0.552	2570	2.9884	0.450
12-31-43	4	0.737	1770	2.3919	0.560
12-31-44	5	0.921	1115	1.9561	0.640
12-31-45	6	1.105	635	1.6282	0.700
12-31-46	7	1.289	315	1.2600	0.768
12-31-47	8	1.473	125	0.9615	0.823
12-31-48	9	1.657	30	0.5000	0.908
12-31-49	10	1.842	0	0.0000	1.000

*Using trapezoidal approximation.

**Accumulation ratio = $1 - \frac{\text{Expectancy at age x}}{\text{Average life (5.43)}}$

EXHIBIT 5

from survivor curves derived from company records will be the same as that which will result from accounting methods using a constant rate based on average life applied to the average investment when all variables are known, can be found in the following arithmetical calculations (Exhibits 4 & 5) showing this equivalence. Exhibit 4 presents the calculations of all annual accruals which will be credited to the accumulated depreciation and the retirements which will be debited to the accumulations. Exhibit 5 presents comparable ratios calculated by using the remaining life expectancy and the average life. A comparison of the last columns of Exhibits 4 & 5 illustrates the equivalence of the accounting method and the method using remaining life and average life.

Improved Accuracy

In summary, the change from individual unit depreciation practices to group depreciation practices eliminates the positive controls on under-or-over accruals which exist with the single-unit methods. In order to maintain control over depreciation accruals, a method which will integrate the amount and time of retirements from the group with the accruals which will be obtained from the group should be instituted. The ratio of average age to average life is an unacceptable measure of accrued depreciation. A method of estimating an adequate amount of accumulated depreciation, such as the one presented above—

which uses average life and average remaining life expectancy — is an acceptable method because the sum of the accumulation plus the current estimate of future accruals equals cost.

When these quantities are applied to the aged dollars representing the dollars surviving of all prior years' installations, an estimate of the accumulated depreciation for an entire account compatible with normal group straight-line accounting will result. This estimate will take into account the many and varied elements which affect the amount of the accumulated depreciation. Thus, a continuing control of the accumulation of depreciation on mass properties can be established which is based on anticipated events requiring only an estimate of the two items, average life and average remaining life expectancy. The degree of accuracy of this control figure can be improved by improving the accuracy of the estimates, which generally can be done by properly using statistical mortality studies.

Including All Leases in the Balance Sheet— A First

by KENNETH R. RICKEY

LENKURT ELECTRIC CO., INC. achieved a *first* by reflecting in the balance sheet *all* its leased facilities and related long-term lease obligations. Prior to December 31, 1958, the following footnote to the financial statements was the only information about land, buildings and equipment the company leases:

> "The company leases substantially all of the plant and equipment used in its operations. These leases expire at various dates from 1958 to 1978. Aggregate rentals thereunder amount to $4,900,000 at December 31, 1957, of which $900,000 is payable in 1958."

This seemed wholly inadequate for anyone analyzing our financial position. We believed there must be a better way to show our leases in the balance sheet.

During the latter part of 1958, we gave considerable thought to this matter and discussed it at length with our auditors, Arthur Andersen & Co., our bankers and other financial people. It was only after very careful consideration that we adopted a new method of presenting the lease rights and obligations in the financial statements of our company. We thought at the time—and we are more convinced after the elapse of some months—that this new method is a major step forward in the proper disclosure of important financial information. Such presentation is not in conflict with generally accepted accounting principles nor with pronouncements of the American Institute of Certified Public Accountants and the Securities and Exchange Commission. We believe that to continue with just the footnotes would be to omit significant plant assets, productive facilities and fixed obligations from the balance sheet.

Outline of the Leasing Problem

Leasing agreements relating to the use of property, even for significant periods of time, have long been used by many business enterprises. Generally, however, these leases have been in the nature of occupancy or other agreements for the use of property for which it is neither customary nor practicable to acquire title. For example, office space and store properties ordinarily have

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been leased rather than purchased. Short-term leasing or the leasing of relatively small amounts of equipment, such as automobiles and trucks, has likewise been a common business practice.

In recent years, however, many companies such as ours have undertaken to lease significant productive facilities—entire manufacturing plants, buildings, and related machinery and equipment. Such lease agreements, we believe, are, in reality, a method of financing, and they bear a close relationship to other forms of long-term debt. The characteristics of such leases are:

1. The decision as between leasing and ownership usually is made on the basis of financial considerations. The desire to avoid the heavy investment of company funds or to conserve working capital, the inability to borrow long-term money directly, and the belief that the leasing arrangement would result in tax savings are important factors considered by many companies in reaching the decision to lease. In the case of companies with loan agreements prohibiting additional debt or prohibiting the pledging of property to other lenders, leasing arrangements have been adopted because such contracts appeared to be outside of the restrictive loan covenants and because accounting practices did not require that the obligation be shown in the balance sheet. The construction or acquisition of property and its immediate sale and lease-back have the essential elements of a mortgaging or borrowing transaction. The fact that the funds may go directly from the investor (lender) to the contractor (seller) is of no significance in the analogy; in most cases mortgage funds are not actually received in cash by the mortgagee.

2. Periodic rentals received by the lessor during the basic period or term of the lease are designed to recover the net cost of the property (cost less salvage, if any) and to provide a return to the lessor on his invested funds. Property leasing of this nature usually may be arranged with (a) a leasing company which, in turn, may borrow funds to finance the property or (b) an insurance company or other financial institution, which generally regards the entire transaction as a form of interest-bearing investment.

3. The lease may contain a provision for renewal beyond the basic period. Such leases also may contain what are usually referred to as "rejectible offer" clauses under which the lessee may offer at any time to purchase the leased property at a predetermined price. If such offer is rejected by the lessor, the lease agreement is then automatically terminated.

Leases of the nature under discussion here are in most respects indistinguishable from mortgages or other debt instruments. There is a firm commitment

to make a series of payments over a fixed period and the lender generally looks to the credit of the lessee (together with a lien on the property) for security. This is true even in situations involving a leasing-company intermediary, since the intermediary ordinarily pledges the property and the lease payments as security for a specific property loan.

It is clear that, under the lease contract, the lessee has acquired a property right (which may not be in the form of title to property) and has incurred a determinable obligation. The question, therefore, becomes one of determining the best method of reflecting the information in the financial statements. It should be borne in mind that the existence of the right and the obligation is not affected in any way by reflecting or omitting the corresponding data in the financial statements.

Attitude of the Business Community

Our decision to reflect lease arrangements in the balance sheet has been strengthened by the views of many leaders in the business community. Informed business opinion is coming to recognize that lease arrangements of the type under discussion here constitute a method of debt financing. Financial analysts express concern that accountants have lagged in recognizing the real nature of lease contracts as constituting, in effect, property rights and the related debt thereon.

Mr. Donald R. Gant, Goldman, Sachs & Co., in an article published in the *Harvard Business Review*, March-April, 1959, states on page 122:

> "To an important segment of the financial community, lease financing . . . (is) another form of debt financing . . . And from this viewpoint there are dangers in the growing trend toward lease financing to the extent that companies using it, and investors . . . fail to appreciate the implications of their mounting lease commitments merely because they are buried in a footnote rather than appearing as liabilities on the balance sheet.

Mr. Gant concludes on page 142 of this article:

> "Every business requires certain fixed assets, and the choice available to it is not *whether* to finance these assets, but *how* to finance them. Lease financing is one way of acquiring assets . . .
>
> "Like all types of borrowing, lease obligations draw on the credit of the borrower, and credit is not a bottomless well. If it is used in one form, it is not available to be used again in another. Accounting deficiencies may have made it possible for some companies to have their cake and eat it too . . ."

In a *Business Week* staff-written article, May 8, 1948, discussing the advantages and disadvantages of lease financing, these comments were made:

> "The fact that such (sell-leaseback) financing isn't reflected on the liability side of a financial statement was listed as another advantage . . . But to us it looks like a distinct disadvantage to the inquiring investor."

Mr. Leslie Gould, syndicated financial columnist, in the May 15, 1957, *Seattle Post-Intelligencer,* outlines the nature of long-term leases and comments on the fact that they represent a "new form of debt that can be just as troublesome in hard times as a mortgage or bonds." Further, Mr. Gould states:

> "They (long-term leases) need greater clarification than a small footnote at the end of a balance sheet. They should be carried as a separate and identifiable item in the balance sheet and earnings report."

Writing in the *N.A.A. Bulletin* for June 1958 (page 31), Gordon Shillinglaw states:

> "The presence of substantial lease liabilities is . . . of great significance to outside investors and, to a lesser extent, corporate management. The only information relating to (lease) obligations that is available to the public must be found in published financial statements, and inadequate disclosure . . . may impose a severe handicap on the outsider who is endeavoring to examine a company's debt ratio and vulnerability to volume changes."

The significance of the long-term lease in measuring the lessee's ability to assume other types of debt has been widely accepted by banks, insurance companies and other lending institutions. Mortgage indentures and loan agreements frequently include provisions relating to lease contracts, the extent to which lease obligations may be incurred and the way they are to be treated in determining significant financial ratios, etc. It is recognized that lease rentals are as much a fixed charge as payments on mortgage debt and that loan restrictions prohibiting prior liens on property might easily be circumvented by sale and lease-back arrangements. Several illustrative examples of loan covenant provisions relating to lease agreements are quoted below:

Delta Air Lines, 1958:

> ". . . engines or propellers on turbine powered planes may be leased, provided that . . . (for certain compliance determinations) . . . there shall be added to funded debt and to the company's investment in flight equipment the value . . . of such leased engines and propellers . . ."

Sears, Roebuck & Co., 1958:

"The Company will not (enter into certain transactions) . . . unless after giving effect to any such transaction Consolidated Unencumbered Assets plus Consolidated Capitalized Rentals will aggregate at least 150% of Consolidated Liabilities plus Consolidated Capitalized Rentals . . .

"Consolidated Capital Rentals means the capitalization determined by dividing by 7½% the largest aggregate amount payable by the Company and Wholly-Owned Subsidiaries for any future fiscal year under the then current term of all leases having remaining terms in excess of three years (with certain exclusions) . . ."

Automatic Electric Co., 1958:

The indenture requires the company to limit funded debt to a specified percentage of net tangible assets and requires capitalized rent payable under sale and lease-back arrangements to be included in the determination of both funded debt and net tangible assets. For example, "funded indebtedness" is defined as follows:

"Funded Indebtedness shall include at any date, all indebtedness which has a final maturity more than one year after such date, and shall include Capitalized Rent under all Restricted Leases."

Statements of the A.I.C.P.A. and S.E.C.

We are concerned that our presentation including leased facilities and obligations in the balance sheet would not be in conflict with generally accepted accounting principles. However, the American Institute of Certified Public Accountants has long recognized the importance of the proper disclosure of long-term lease obligations in financial statements. Chapter 14 of Accounting Research Bulletin No. 43, published in 1953 by A.I.C.P.A. as a revision of A.R.B's. Nos. 1 through 42 reads in part as follows:

Paragraph 1:

"The growth in recent years of the practice of using long-term leases *as a method of financing* has created problems of disclosure in financial statements . . ." (Underscoring supplied.)

Paragraph 5:

"The committee believes that material amounts of fixed rental and other liabilities maturing in future years under long-term leases and possible related contingencies are material facts affecting judgments based on the financial statements of a corporation, and that those who rely upon financial statements are entitled to know of the existence of such leases and the extent of the obligations thereunder, irrespective of whether the leases are considered to be advantageous or otherwise.

Accordingly, where the rentals or other obligations under long-term leases are material in the circumstances, the committee is of the opinion that:

"(a) disclosure should be made in *financial statements* (underscoring supplied) or in notes thereto of:

"(1) the amounts of annual rentals to be paid under such leases with some indication of the periods for which they are payable and

"(2) any other important obligation assumed or guarantee made in connection therewith;"

Paragraph 7:

"Since the lessee in such cases does not have legal title to the property and does not necessarily assume any direct mortgage obligation, it has been argued that any balance sheet which included the property among the assets and any related indebtedness among the liabilities would be incorrect. However, the committee is of the opinion that the facts relating to all such leases should be carefully considered and that, where it is clearly evident that the transaction involved is in substance a purchase, the 'leased' property should be included among the assets of the lessee with suitable accounting for the corresponding liabilities and for the related charges in the income statement."

Article 3 of Regulation S-X, adopted by the Securities and Exchange Commission as generally applicable in the preparation of financial statements for inclusion in filings with the Commission, states in Rule 3-18:

"(a) If material in amount the pertinent facts relative to firm commitments for the acquisition of permanent investments and fixed assets and for the purchase, repurchase, construction, or rental of assets under long-term leases shall be stated briefly *in the balance sheet* or in footnotes referred to therein. (Underscoring supplied.)

"(b) Where the rentals or obligations under long-term leases are material there shall be shown the amount of annual rentals under such leases with some indication of the periods for which they are payable, together with any important obligation assumed or guarantee made in connection therewith. If the rentals are conditional, state the minimum annual amounts."

These rules of S. E. C. and pronouncements of A. I. C. P. A. relate generally to the significance of material lease commitments, particularly where they are a substitute for other methods of financing, and to the necessity that they be stated or disclosed in the financial statements or in the footnotes. The method of statement or disclosure is not specifically limited and it seems clearly evident from the foregoing that accounting concepts are changing, to recognize that

present leasing arrangements require a recording of *Leasehold Interest in Facilities* as an asset and the related *Rentals Payable on Leasehold Properties* as a liability in order to fairly present the financial position.

Contrasting Balance Sheet and Footnote Presentation

Two exhibits contrast the two methods—

Exhibit 1—Footnote presentation which includes only part of the lease information.

ZED CORPORATION

BALANCE SHEET -- DECEMBER 31, 1958

($000 Omitted)

CURRENT ASSETS:		
Cash	$2,000	
Accounts receivable	5,000	
Inventories	6,000	
Total current assets		$13,000
OTHER ASSETS		1,000
Total		$14,000
CURRENT LIABILITIES:		
Notes payable	$2,000	
Accounts payable	1,000	
Accrued liabilities	1,000	
Income taxes	1,000	
Total current liabilities		$ 5,000
STOCKHOLDERS' EQUITY:		
Common stock	$3,000	
Earnings retained in the business	6,000	9,000
Total		$14,000

NOTE: The company leases substantially all of the plant and equipment used in its operations. The leases expire at various dates from 1959 to 1979. Aggregate rentals thereunder amount to $9,000. At December 31, 1958, of which $550 is payable in 1959.

EXHIBIT 1

ZED CORPORATION

BALANCE SHEET -- DECEMBER 31, 1958

($000 Omitted)

CURRENT ASSETS:		
Cash	$2,000	
Accounts receivable	5,000	
Inventories	6,000	
Total current assets		$13,000
OTHER ASSETS		1,000
LEASEHOLD INTEREST IN FACILITIES at discounted amount of related long-term lease obligations (see Contra):		
Land and buildings	$4,000	
Equipment	2,000	6,000
Total		$20,000
CURRENT LIABILITIES:		
Notes payable	$2,000	
Accounts payable	1,000	
Accrued liabilities	1,000	
Income taxes	1,000	
Current portion of rentals payable	500	
Total current liabilities		$ 5,500
RENTALS PAYABLE ON LEASEHOLD PROPERTIES discounted at rates used in the respective leases (see Contra):		
Land and buildings expiring at various dates to January 15, 1979	$4,000	
Equipment expiring at various dates principally to December 31, 1963	2,000	
	$6,000	
Less current portion shown above	500	5,500
STOCKHOLDERS' EQUITY:		
Common stock	$3,000	
Earnings retained in the business	6,000	9,000
Total		$20,000

EXHIBIT 2

Exhibit 2—The new way adopted by our company reflecting lease rights and obligations in the balance sheet.

The differences in the financial make-up of the two balance sheets are apparent immediately. The assets are almost 50 percent larger in Exhibit 2. Current liabilities are increased and long-term liabilities are placed in their proper perspective—yet this is the same company in every respect.

How do the common ratios compare?

	Exhibit 1 *(Leases in footnote)*	*Exhibit 2* *(Leases in balance sheet)*
1. Current ratio	2.60 to 1.00	2.36 to 1.00
2. Quick ratio	1.40 to 1.00	1.27 to 1.00
3. Liabilities to equity	55%	122%
4. Fixed assets to equity	0%	67%
5. Assume the company had net earnings of $2,800 for the year, what is the return on assets in use?	0% 20%	67% 14%

The differences are significant and important to management, bankers, investors and bond rating houses, and should not be left to chance in a footnote.

Terminology in the Balance Sheet

Considerable thought was given to selection of suitable captions to be used in the balance sheet, as we believed this was an important matter. In describing the asset, we felt that *Leasehold Interest in Facilities* properly explained the property rights contained in the leases. We further believed that the basis of valuing the asset must be described, so the words "at discounted amount of related long-term lease obligations" were used in order that a reader would understand how we arrived at the amounts. Just as fixed assets are classified in the balance sheet, equipment is segregated from the land and buildings, because the lease life of the two are quite different. Each year the leasehold interest will be reduced in much the same way as depreciation is taken; however, it will not be shown as a deduction from the original leasehold interest as reserve for depreciation but directly offset against the original cost of the asset in the accounts. At the end of the lease, the leasehold interest will be completely amortized.

On the liability side of the balance sheet, we recognized that the rentals pay-

able within one year are current liabilities. Rentals due beyond one year were included in the long-term liability section. We believe the wording used to describe the liability, *"Rentals Payable on Leasehold Properties,"* is clear and easily understood. Again, as on the asset side, we used the word, "discounted," but went a little further and said "discounted at rates used in the respective leases," which gives fact and substance to our figures. At first we were not going to separate the equipment from the land and buildings in the liability section. However, after careful consideration, we decided it would be more meaningful if we did, because of the longer term of the land and buildings leases compared with equipment leases. Our bankers concurred in this treatment. The date of expiration on the last lease was shown, so that the reader would have some knowledge of the term of the liability and the leasehold interest. In the long-term section, the total lease liability was shown and the current portion deducted from it.

Information Is Needed

Finally, we in the accounting profession have an obligation to management and the investing public. Each must be given the complete information it needs. Certainly those of us in industry do provide our managements with the full details of any future commitment that will affect operations, such as lease rentals, long-term debt obligations and fixed interest charges. Then, doesn't it seem reasonable that you and I, as an investor in any company, should be entitled to know what effect lease obligations may have on future operations? And, also, to know what assets the company holds in leaseholds?

The financial community wants the information. People who lend money insist on it. The American Institute of Certified Public Accountants and the Securities and Exchange Commission do not object to more disclosure. Therefore, we must conclude it is management which has not given the problem of disclosure of leases full consideration. Certainly, any good management will not hesitate to break with tradition and pioneer something new and better. Therefore, including *all* leases in the balance sheet is a very logical, forward step in the proper reporting of financial information.

Functional Measurement for "Management by Objective"

by W. ROBERT SHAPTON

THE APPROACH to functional measurements set forth in this article was taken by the Light Military Electronics Department, a decentralized operating component of the General Electric Company, and represents the experience of this specific Department. The program to be described ties in directly with the concept of "management by objective," which such a program implements, and the formal system of communication, which such a program provides. The necessity of evaluating the performance of a function in terms of its own objectives is basic to functional measurements.

Douglas McGregor points out that "The essential task of management is to arrange organizational conditions and methods of operation so that people can achieve their own goals *best* by directing *their own* efforts toward organizational objectives."[1] In following out this thought, there appears to be two main areas of endeavor in the development of a functional measurements program:

1. To establish objectives, set goals within these objectives, make plans to achieve the goals, and measure the results, that is, the measurement of achievements in relation to goals.
2. To develop quantitative measurements of activity applicable to specific areas within a function wherever possible, that is, the measurement of indexes in relation to standards.

Setting Up Goals and Measuring Their Attainment

Goal measurement consists of evaluating achievements against predetermined goals set by mutual agreement between the individual in charge of a function being measured and the individual to whom he reports. The most important advantage to be gained from this type of measurement is that it contemplates constructive management participation at the lowest organizational level, an objective of decentralization. By periodically setting up new achievements and

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[1] Douglas Murray McGregor, "The Human Side of Enterprise," *The Management Review*, November 1957, p. 89.

new goals, this type of measurement retains the active interest of the personnel involved; this in turn ensures the continuous validity of the measurements and in a sense sets up an automatic "feedback" relationship.

It is of utmost importance that the goals be challenging; nothing is gained by setting up "paper tigers" or goals which will be easily or automatically achieved. Furthermore, goals must be tied to tight completion dates, in order to provide a basis for measuring the degree of accomplishment, thus satisfying the requirement that goals be measurable. The setting of good goals is further complicated by the existence of both independent and dependent goals. Independent goals are main goals. Dependent goals are subordinate to these main goals. Independent goals are expected to benefit the organization, whereas dependent goals merely represent steps or milestones toward the main goal. The difficulty is that there is a tendency to look upon the dependent goals as sufficient in themselves, especially when they are shown apart from the main goal. Dependent goals should not be set up as separate goals; they should, instead, be integrated with the main goals of which they are a part. Needless to say, allowing dependent goals to be shown separately implies the stature of an independent goal and thus weakens a measurements program. Therefore, a policy which encourages the selection of as many goals as possible, followed by a screening to upgrade or eliminate those which do not present a challenge, appears to be the best solution. Of course, goals apply only to the functional group setting them and should not indirectly represent measurements of another group. Since the achievement of a goal is then applicable only to the group for which the goal has been set, the usefulness of goal measurements for comparison with other groups is consequently limited.

The best insurance toward achieving a goal is a well thought out plan, which outlines the major steps necessary to achieve a goal in sufficient detail so as to provide good progress check-points at regular intervals. A good plan will not only demonstrate the feasibility of a goal but may also provide a basis for later measurement. There is also a planning aspect to goals, which does not usually pertain to chores accomplished in the ordinary course of business.

The purpose of planning is to determine ahead of time the best approach out of various alternatives in view of limitations in personnel, facilities and time. Moreover, implicit in the planning process is acquiring the commitment of others who would be directly or indirectly affected. Goals are usually set for completion within one year in order that they may run in parallel with the budget. In this way, the measurements program can be integrated with the business plan. However, the scheduling of additional goals throughout the year is recommended.

Comparison Standard-Index as Means of Measurement

Index measurement consists of comparing actual indexes against standards. It is also possible to set goals in the terms of an index to be achieved. However, indexes differ from goals in three important respects:

1. Indexes provide continuing control on an exception basis, while goals represent one-time projects, usually measured by means of progress on a time scale.
2. Indexes are basically mathematical relationships, whereas goals are more likely to involve concepts which cannot be easily measured in mathematical terms.
3. The standards against which indexes are measured may not be considered reasonable by the individual in charge of the function being measured.

Measurements must be so constructed as to be useful in appraising both current results and future projections in order that a proper balance be maintained between immediate results and long-term objectives. This applies in particular to indexes because they make comparison possible within the same work group or between similar groups over a period of time. Furthermore, by being numerical and combinable, indexes enable the measurement of progressively higher organizational layers. Indexes compared against standards can pinpoint areas in an organization which are not in balance. If a certain type of occurrence accurately describes the function of an organization, the frequency of these occurrences becomes an index of its volume of activity. For example, an additional index relating the number of these occurrences to the number of personnel assigned or to the number of man-hours worked would then indicate the area's relative activity within reasonable limitations. Whenever we are able to set standards for such an index, we have a basis for determining whether our levels of output are reasonable and whether we are properly organized to perform the function.

Indexes do not usually indicate quality of performance. Not only do they ignore the quality factor, they can be downright misleading if we assume improvement by an increase or the opposite from a decrease. We must look behind the index and consider the factors which cause an increase or decrease.

General Characteristics of Measurements

Measurements should possess the following characteristics:

1. They should be prompt and thus make it possible that remedial action be taken in time. (However, the necessity of keeping spe-

cial records should be avoided; the use of currently available records is preferable, both from an economic standpoint and because they usually provide an automatic crosscheck on the accuracy of measurements).

2. They should be constructive in order to promote the best interest of the company.
3. They should be meaningful, i.e., understandable and logical to those responsible for the function being measured as well as to those doing the measuring.
4. They should be realistic; they should be measures of true accomplishment.

Finally, a measurements program must have the whole-hearted support of the organization's management, which has the ultimate responsibility for the success of the program.

The Role of Standardization; Reporting Forms

The quality of functional measurements varies, depending upon the type of work performed by the function. Although the degree of difficulty in meas-

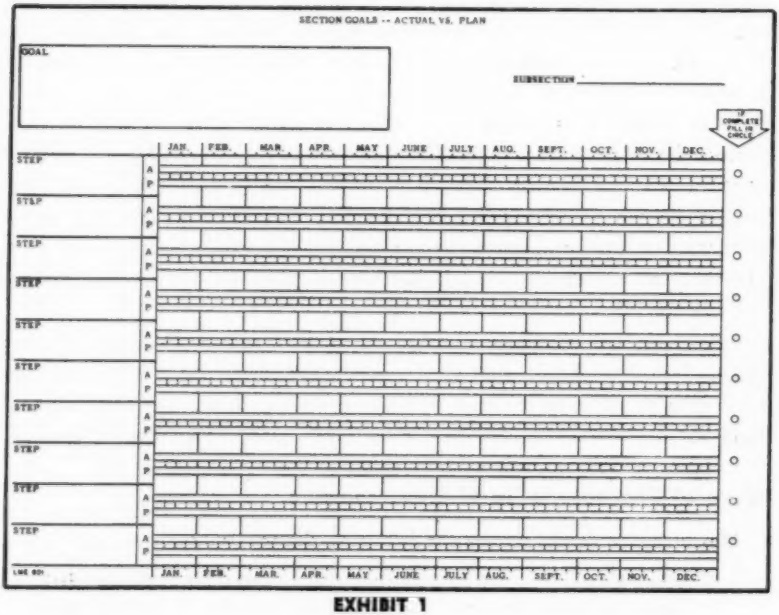

EXHIBIT 1

uring within the various functions differs markedly, it does appear both possible and desirable to standardize reporting systems in order to simplify administration of the programs and ease the workload of the individuals involved.

Two reporting forms might be considered basic. The first is a reporting form, prepared by the person accountable for performance and approved by his immediate supervisor, which merely lists objectives, goals or standards, and plans in 1-2-3 order; each of these terms is briefly defined on the form to guide the user. By being rather elementary, this form also serves an educational purpose early in a program when few personnel are well acquainted with measurements. For measurement purposes, this form can be usually supplemented by additional schedules or graphs. The second form is a time-chart (Exhibit 1) which shows progress on a time scale towards attaining a goal. This report compares, on a weekly basis, the actual versus the planned expenditure of time to accomplish a sequence of planned steps. As a measurement, it is most useful in portraying the over-all status of a goal by indicating whether or not the steps toward achieving it are on schedule.

Standardization reduces the clerical work involved in a measurements program to manageable proportions by enabling presentations to be submitted on the same form. Furthermore, standardization places into sharper perspective the procedure of establishing objectives, setting goals or standards, and making plans, thereby resolving differences of opinion concerning the meaning of terms.

Functional Measurements Programs

We have been reasonably certain from the beginning that an effective functional measurements program has to receive its impetus from within a function. Since measurements are part of the work of each function, rather than a program of controls to be superimposed from outside the function, a first step would be to request that someone within each major functional group be designated as responsible for the installation and maintenance of its measurements program. In addition, considerable effort should be made in helping these representatives develop and improve their measurements programs. The eventual goal in each case is a program that would be self-generating and ever-widening in its effect, with the concept of measurement gradually becoming a more active part of the work of each organizational component.

Not all of the problems encountered in setting up functional measurement programs are obvious. If we were to list one major recurring problem above all others, it would be the semantic difficulty that people have in distinguishing between objectives and goals.

Objectives are aims and purposes expressed in broad, general and qualitative terms, which will endure over a long period of time. Objectives are not merely statements of responsibility taken from a "position guide." They contain more of a qualitative and future-looking element. Goals are derived from objectives and are specific and measurable. Plans and programs are elements of work scheduled to achieve the goals and should include standards of performance.

Nevertheless, the distinction between objectives and goals is not always apparent to those who are expected to use them in their work. In order to clarify this problem, the fact that goals must be specific and measurable as well as worthy should be emphasized, and comprehensive lists of clear, concise objectives for each functional area should be established.

A partial answer to the problem would be to ask each manager to establish his own objectives. Although this may be the expedient thing to do where objectives have not been previously considered, it is not a permanent solution. Asking that a manager set his goals is one thing; asking that he establish his objectives is another. For the objectives of the various parts of an organization are tied in directly to its structure. And what we want from objectives is the assurance not only that all bases are covered once but also that some are not covered twice. An immediate advantage is the pin-pointing of responsibility as opposed to the dilution of effort when more than one person tries to do the same job. If we expect a program of "management by objective" to be effective, the objectives must be integrated throughout the organization.

In emphasizing the teamwork aspects of objectives, Peter Drucker states that a manager's objectives:

> "Should lay out what performance the man's own managerial unit is supposed to produce.
>
> "Should lay out what contribution he and his unit are expected to make to help other units attain their objectives.
>
> "Should spell out what contribution the manager can expect from other units toward attainment of his own objectives."[2]

Considering that objectives are expected to endure over a long period of time, it follows that commensurate effort must be expended in writing them to ensure that they will withstand this test of time and will provide clear direction to those expected to attain the aims and purposes of the functional group. In general, there is no excuse for cloudy cross-relationships between the various objectives of a functional group. Such cloudiness only indicates a lack of preciseness in understanding the aims and purposes of the group. So much the

[2] Peter F. Drucker, *"The Practice of Management"*, Harper & Brothers, 1954, p. 126.

better if this lack of clarity can be eliminated through establishment of well-written objectives by someone not too easily satisfied with his first efforts.

It is not necessary that the objectives for each function be numerous as long as they adequately describe its aims and purposes. The important thing is to make them clear. For practical purposes, this also means make them simple. Each objective should convey only one main area of expected endeavor. In the same way that an independent goal becomes side-tracked by emphasis upon dependent goals, objectives can be vitiated by needless complexities and numerous conditions. Although certain objectives apply to one function alone, there are a few common-to-all objectives, applicable to every function. These would be objectives relative to economic operation, working climate, personnel development and community participation.

Some of the confusion between objectives and goals is caused by the existence of dependent as well as independent goals, previously mentioned. For example, in concentrating on a dependent goal, the independent goal of which it is a part begins to look like an objective. This difficulty becomes less and less troublesome as functional objectives become permanently established. It is, of course, possible to select good goals without having a formal list of objectives. This indicates a reliance upon objectives which are solely intuitive. At the same time, it is difficult to conceive of an efficient and integrated organization without well-defined objectives for each of its components which enables each manager to set his goals in the light of all of his objectives. And, when measuring the performance of a function, the fact that current goals cannot always be set for all of the objectives need not cause them to be eliminated from overall consideration.

Functional Measurements Applied to Finance

A measurements program for our financial function was launched with a letter which briefly described the program to all the financial subfunctional managers and asked that each manager set goals or standards for the year. In our letter, a goal was defined as a desired achievement within a given period of time, in this case a year, and a standard was defined as a desired index to be attained at all times. The financial measurements program for the first year was started too late in the year to be integrated with the budget. The program for the following year was made a part of the budget and each financial area was required to submit its goals along with its budget. Consequently, the program for the second year showed a great improvement.

Although the original concepts on which the program is based have become

further refined, the essential elements have not changed since its inception. In our experience with the program, we have found the setting of goals to be relatively uncomplicated in comparison to the choosing of indexes. The latter is much more difficult than might be assumed at first glance, because the establishment of good indexes is dependent upon a repetitive action or occurrence. With this in mind, it is understandable that, although a program of goals can be implemented rather rapidly, the development of indexes can be expected to proceed more slowly.

Our original intent was to use a dual-purpose reporting form designed for both goals and indexes. However, for a measurements program consisting mainly of goals, the time chart proved more satisfactory. This form could be supplemented by additional schedules or graphs when it was considered necessary or desirable to show supporting tabulations or ratios. Each goal chosen was shown on the standard time-chart form. For visual comparison, each main step of the plan to achieve the goal was listed on the form with the planned expenditure of time in one color and the actual expenditure of time in another. The goals of each group were then arranged in a "package" for reporting purposes. Along with goals and indexes, we have pursued a program of establishing written objectives for each financial area. These objectives not only set forth their own expected contribution but also illustrate their over-all integration with other areas of the department.

Financial Goals . . .

Since the ultimate justification of measurements is the benefit derived from them, a primary basis for weighing the merit of a functional measurements program is the extent to which the program has helped each manager in his work. In the following paragraphs, the results of our financial measurements program are reviewed with a few examples of both goals and indexes cited to illustrate our over-all program.

The goals of our procedures group, where the work performed is fundamentally nonrepetitive, are based on a planned allocation of the available time of procedures personnel. These goals are integrated with goals of other areas in the department in determining which projects should or could be undertaken. Two major benefits are derived. First, the goals provide a work-load basis for forecasting budget requirements. Second, a balanced, planned program helps keep efforts directed toward projects of greatest potential benefit to the department. Nevertheless, there is constant pressure to divert procedures personnel to the many special projects which come up during the year, often referred to as

"fighting fires." With so many choices as to which tasks should be performed, a planned program has been a stabilizing influence towards maximum accomplishment. Goals and planning are a real stimulus to more efficient utilization of personnel and improved long-range planning.

The internal auditing group's goals are based on the planned allocation of audit personnel time in a manner similar to that used in the procedures area with essentially the same benefits. The goals of this group consist primarily of a comprehensive internal audit program for the department.

Data processing goals for the first year primarily reflected the mechanization schedules of othe groups, and were largely affected by converting procedures to machine accounting. Since these goals were not exclusively the planned accomplishments of data processing alone, measurements based on them were also not specifically applicable to data processing. The goals for the second year were a substantial advancement in that those chosen were controllable by data processing; for example, one of the goals was to improve machine utilization.

A goal in the product cost accounting area was the development of a checkform to show the progress of work on major projects. The resulting form provides for the setting of target dates for each step necessary to accumulate, analyze, control, report and liquidate costs on these projects. The establishment of target dates is particularly important to ensure the availability of current cost data for preparing redetermination proposals.

The goals of our budgets and measurements group have emphasized increased accuracy in forecasting and improvement in reporting systems. For example, both our engineering and manufacturing expenses have been placed on a step, or flexible, budget to provide better expense control. Additional goals of this group have been concerned with the establishment of measurements programs.

. . . *And Financial Indexes*

As mentioned previously, a prerequisite for an index is a repetitive action or occurrence. There are few such areas within finance. However, reasonably satisfactory indexes have been developed in several areas. In general, these indexes are output-input relationships which, together with rough standards, serve as indicators of organizational efficiency. Admittedly, these indexes are subject to further refinement and improvement. Some representative indexes are described in the following paragraphs.

For the personnel accounting unit, a weekly output index has been devised. It relates the number of payroll items processed in "clerk-days required" to

the number of "clerk-days applied." The items processed are considered a good index of the unit's activity and include vacation payments and adjustments to prior earnings as well as the current week's earnings. This output is converted to clerk-days required by using current standards which reflect the number of piece-work items and of salary or day-work items processed per clerk-day. These standards have been set rather loosely and it is expected that they can be improved considerably. The standards are presently based on the number of piece-workers and the number of salary or dayworkers paid by each payroll clerk.

Two indexes have been developed in the shop accounting unit to indicate its activity. The primary index is the number of hourly operators handled by each shop accounting clerk. This index is applied "across the board" to all clerks, whether for piece-workers or dayworkers. The secondary index is the number of piece-worker vouchers processed per clerk, which serves as an additional indicator of activity in the piece-work area alone. Coupled with standards, the indexes afford a basis for the efficient utilization of shop accounting personnel. Based on these indexes, clerks are reassigned to reflect varying workloads. At the same time, an effort is being made to tighten the current standards without adversely affecting the accuracy of the work performed.

The first accounts payable index is the number of days invoices on hand. A standard has been determined which represents a normal acceptable workload; an automatic warning occurs when this standard is exceeded. This index eliminates the need for checking the workload of the accounts payable unit under normal conditions. However, this index does not indicate the unit's capacity because the workload on hand is based upon inputs alone. For this reason, a supplementary invoice output or activity index is recommended.

Another index relates the proportion of accounts payable people to total inventory. Although this index is not extremely sensitive, it is helpful in determining wheher the unit is properly staffed. Based on the experience of those months considered efficient, a standard for the number of accounts payable people per each million dollars of total inventory has been developed.

The risks of government contracting make cost estimating extremely important, especially in a job shop manufacturing operation. As indexes for our cost estimating unit, the number of estimates received, completed and in process provides a work-load control and is indicative of trends as well as the current activity. Comparison of the actual number of estimates in process with past experience helps determine the best approach toward efficient application of available estimator time. Conversion of the workload to estimator man-hours is being considered as a refinement. If found to be practicable, this will provide an improved measurement.

As a part of the financial measurements program, an important aspect of work which appeared worth measuring was the timeliness of financial reports. This, of course, presumed that the due-date set for each financial report was mutually satisfactory to its preparer and recipients, considering both the reporting workload and the need for prompt control information. For the purpose of measuring timeliness, all reports are assumed to be of equal importance. It might also be mentioned, in passing, that all financial reports were recently reviewed with the recipients of the reports, to determine their usefulness. The following arbitrary scale was devised to give the concept of timeliness a numerical base:

Report Issued	*Timeliness*
On time	5
1 working day late	4
2 working days late	3
3-5 working days late	2
Over 5 working days late	0

It may be noted that the scale drops off rapidly to indicate the decreased value of late information. In our opinion, the average financial report loses its timeliness when it is over a week late. Furthermore, there is no premium for having a report ready ahead of time. However, if it is desirable and possible for a report to be prepared sooner, the due date can be changed accordingly.

A monthly over-all timeliness for each primary finance group is computed by taking a simple average of the timeliness on all reports issued during the month. Each group submits a monthly listing of all reports prepared, as well as the over-all timeliness for the subsection as a whole. This measurement has been useful in keeping us aware of the many reports prepared as well as in keeping them on time.

The foregoing brief description of our financial measurements program is not intended to be all-embracing. In fact, the specialized nature of most goals and indexes makes it difficult to describe examples that would be applicable for other organizations. However, it is hoped the examples chosen are concrete enough to show the practical benefits derived from functional measurements.

Potentials of Functional Measurements Programs

We are only beginning to realize the potential of our functional measurements program. It is appropriate to remark that a favorable "measurement climate" has been most beneficial. Not only is the program being actively imple-

mented in the finance area but also in our other functional areas such as engineering, manufacturing, marketing, and employee and community relations.

Considerable effort has now been expended throughout our department on functional measurements. For example, the department's most recent internal business reviews have been tied in closely with goals. As we progress, we are building continuity into the programs by attempting to make the programs self-regenerative. To a large extent, the effectiveness of functional measurements is dependent upon the frequency of "feedback." Regular review furnishes the necessary stimulus toward improvement.

A functional measurement program encourages integration of effort through management by objective and improvement in communication. A functional measurements program is basically simple. There is every reason to believe that a functional measurements program—such as the one described—could be used beneficially in other organizations. This approach hits at problem areas that would otherwise be left alone; the consequences are that the organization gets the best effort from each function. The very fact that a functional measurements program exists in an organization is a powerful stimulus for each area to do a better job today than yesterday, and a better job tomorrow than today. As has been often pointed out, the span of managerial responsibility can be expanded furthest when we manage by objective. But unless there is a follow-up or feedback, there is no assurance of other than average performance.

Functional measurements, in effect, ask each function to do a better job, that is, "walk the second mile." Needless to say, when each function of an organization is constantly trying to improve its performance, the result is better performance by the organization as a whole.

The Dollar Value Method of "Lifo" — How It Works

by WILLIAM J. SWITAJ

IN RECENT YEARS many articles have been written citing the advantages and disadvantages of the "lifo" method of inventory valuation. The controversy in these articles has caused the term "lifo" to be shrouded in a veil of mystery. Those who have taken the time to study and understand "lifo" have lifted this veil and have found it to be a good and sensible method of matching current costs to current sales. The application of "lifo" to a segment or even to an entire inventory is relatively simple and is far from time consuming. The purpose of this article is to show the reader the steps to be taken in an application of "lifo" to an existing inventory valued under the "fifo" method.

The two fundamental methods of "lifo" application are the quantity and dollar value methods. Dollar value places the emphasis on dollars of inventory instead of physical units. Dollar increases in inventory valued at "lifo" are adjusted to reflect the rise or fall in price for merchandise by reference to, first, average or most recent acquisitions. It is the more widely useful of the two methods.

The quantity method is useful only in the simplest of inventory situations and it is the author's opinion that most inventories are not simple. The reason for the author's preference for the dollar value method may best be demonstrated by briefly discussing certain important disadvantages of the quantity method which are not applicable to the dollar value method. Under the quantity method (1) items of inventory which differ in kind and costs are segregated into "lifo" groups, (2) the number of groups under the quantity method could become burdensome for record-keeping purposes, (3) in a business with changing products, some groups would disappear and new groups appear from time to time. Thus, some portion of the inflation income sought to be eliminated under the "lifo" method would be recognized each time a "lifo" group disappeared or substantially declined in quantity.

These disadvantages may be minimized under the dollar value method if

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proper segregation of the inventory into pools is made. This article will deal only with the dollar value method of "lifo" because of its broader application.

Adoption of "Lifo"—Application Form

The use of "lifo" first became available to all under the Revenue Act of 1939. However, it was the opinion of revenue agents that "lifo" was applicable only

FORM 970 (REV. NOV. 1954)	U. S. TREASURY DEPARTMENT - INTERNAL REVENUE SERVICE APPLICATION FOR THE ADOPTION AND USE OF THE ELECTIVE INVENTORY METHOD PROVIDED BY SECTION 472 OF THE INTERNAL REVENUE CODE OF 1954	TO BE EXECUTED AND FILED IN TRIPLICATE. SEE INSTRUCTIONS ON REVERSE.

NAME OF TAXPAYER

ABC Printing Company

ADDRESS *(Number, street, city or town, postal zone, State)*

1000 Offset Road, Cleveland 1, Ohio

hereby makes application to adopt and use the elective inventory method provided by section 472 of the Internal Revenue Code of 1954 and to have such method first applied as of the close of the taxpayer's taxable year ending _____ with respect to the following specified goods which are subject to inventory *(use additional sheets if necessary)*:

All sizes and grades of printing stock on hand and in process

The taxpayer hereby agrees to such adjustments incident to the change to the elective method, or to the use of such method, or to any later change from such method, in the inventories of prior taxable years or otherwise, as the Commissioner of Internal Revenue upon the examination of the taxpayer's returns for the years involved may deem necessary in order that the true income of the taxpayer will be clearly reflected, and, in support of this application, represents as follows:

1. Nature of business Printers and Publishers
2. Inventory method heretofore used Cost
3. Were any of the foregoing specified goods which were on hand at the beginning of the taxable year taken into the closing inventory of the preceding taxable year at values other than cost? ☐ YES ☒ NO
4. Goods subject to inventory not to be inventoried pursuant to elective method *(use additional sheets if necessary)*:

Labor and overhead in work in process

5. (a) Did the taxpayer issue credit statements, or reports to shareholders, partners, or other proprietors, or to beneficiaries, covering the first taxable year to which this application refers? ☒ YES ☐ NO

(b) If "yes," to whom, and on what dates Shareholders and noteholders on or about 3/5/56

(c) Inventory method used in ascertaining income, profit, or loss for the purpose of such statements.

Elective inventory method for all items for which election is hereby made.

6. Method the taxpayer uses to determine the cost of the goods in the closing inventory in excess of those in the opening inventory. *(See the regulations under section 472 of the Internal Revenue Code of 1954.)*

Dollar value method. Relationship between prices at the beginning and end of the year is determined by the use of an index. The index comprises a representative number of items in inventory and aggregates approximately 60% of the value of stock on hand.

DECLARATION

I declare under the penalties of perjury that the foregoing application (including any accompanying statements) is made in good faith, pursuant to the requirements of section 472 of the Internal Revenue Code of 1954 and the regulations issued thereunder, and, if made for a corporation or partnership, is duly authorized, and that the statements made therein are, to the best of my knowledge and belief, true, correct, and complete.

Taxpayer's Signature ABC Printing Company

(If a corporation) (CORPORATE SEAL)

Officer's name and Title Joe Jones, President

EXHIBIT 1

to industries having relatively few basic commodities that could be accounted for readily in terms of units of quantity, e.g., oil, rubber, textiles, leather, copper and other metal industries. Finally, in 1949 the Commissioner of Internal Revenue acquiesced in decisions rendered by the tax courts and amended the regulations to make "lifo" available to all taxpayers.

An application for the adoption and use of "lifo" must be filed on Form 970 in triplicate. A filled-in copy of this form, using hypothetical answers, is shown as Exhibit 1. The election is made in the tax return for year in which the method is adopted; no election prior to the filing of the return is needed. The taxpayer, if he has obtained an extension of time to file, finds that he has the benefit of reviewing economic conditions for approximately the first five months of the year following the close of his taxable year. Once "lifo" is adopted, it must be used in all subsequent years, unless the Commissioner of Internal Revenue requires the taxpayer to use another method.

Base Year Inventory — December 31, 1956

Under the dollar value method, the extent of change in cost levels is generally determined by a dual extension (year-end quantity extended by both the beginning and the end-of-year prices) of the quantities in the closing inventories. What source is used to obtain the percentage of price change during the year? May indexes built up by government groups or industry groups be used? The Bureau of Labor Statistics develops the indexes used by the retail department stores. However, in informal discussions, representatives of the Internal Revenue Bureau have stated that indexes should be built up by individual taxpayers.

To illustrate the development of an individual taxpayer index, let us consider a printing plant with an annual sales volume of approximately $3,000,000. To satisfy customer demands, the printer is required to keep in inventory different sizes and weights of paper ranging in price from $15 to $31 per cwt. There are approximately 50 to 75 different sizes and weights of paper in the inventory. Experience has shown that each year several new items appear in the inventory and several of the items included in the prior year-end inventory are no longer being used. As was stated earlier in the article, "lifo" under the quantity method would negate the inflation income sought to be eliminated when changes take place in the inventory. Because of the conditions mentioned above, the printer decided to elect the dollar-value method of "lifo" valuation.

Index of Representative Items of Paper in Stock

Description - Size - Weight	12/31/56 Quantity pounds	12/31/56 Unit "fifo" cost	12/31/56 Prices Amount	12/21/55 Unit "fifo" cost	12/21/55 Prices Amount
No 2 coated 25 x 38 - 160	8,880	.1955#	$ 1,736	.1855#	$ 1,674
" " 35 x 45 - 232	45,375	.1867#	8,470	.177 #	8,031
" " 37-1/2 x 38 - 210	31,920	.184 #	5,873	.177 #	5,650
Machine coated 38 x 50 - 240	31,780	.156 #	4,958	.150 #	4,767
Eggshell 27-1/2 x 28 -82	15,826	.149 #	2,358	.149 #	2,358
Super Book 27 x 38 - 108	2,916	.175 #	516	.163 #	475
			$51,931		$50,018
			103.76%		100.00%

100
193.76 = 96.38% - Apply to 1956 inventory to reduce to 1955 price level.

EXHIBIT 2

The first step was to select a representative portion (say approximately 55 percent to 70 percent) of the total inventory value on which to base the index. This resulted in the selection of approximately 35 items. A dual extension of each item was made using the January 1, 1956 and the December 31, 1956 market values (Exhibit 2). The index at January 1, 1956 was equal to 100 percent and the index at December 31, 1956 was equal to 103.76 percent or an increase of 3.76 percent in the cost of paper. Exhibit 3 illustrates the application of the price index we have established to the December 31, 1956

Paper - "Lifo" Computation

December 31, 1956

	Total
Paper inventory at "fifo" cost 12/31/56	$ 96,020
1956 inventory at 1955 price level - 96.38%	$ 92,544
1955 inventory at 1955 price level	$ 135,293
1956 inventory at "lifo" value	$ 92,544
1956 inventory at "fifo" value	96,020
"Lifo" adjustment	$ 3,476

EXHIBIT 3

inventory at "fifo." At that price the paper inventory at "fifo" was $96,020; this same inventory, valued at the January 1, 1956 price level, would be $92,544 (96.38 percent of $96,020). Since the 1956 inventory at "lifo" was compared to the 1955 inventory at the 1955 price level and the December 31, 1955 inventory was greater, no increment in the initial year of "lifo" was present. The adjustment made was a debit to cost of sales, increasing the cost and thus decreasing the profit by $3,476, and a credit to the "lifo" reserve for the same amount. This resulted in a tax saving of $1,808, not substantial by some standards but, to a small business, the "dollar-in-pocket" concept is important.

Increment — 1957

In the subsequent year, the dual extension of inventories was repeated and resulted in a 1957 "lifo" index of 106.18 perecent. After bringing the year-end inventory ("fifo") down to the price level prevailing at the beginning of the year and comparing it to beginning inventory (Exhibit 4) at the same price level, a difference of $28,629 is noted, which represents the 1957 increment due to change in quantity. The next question to be resolved is at what acquisition level should this increment be valued? The Internal Revenue Code allows the taxpayer to make his choice. Prices of acquisitions at the beginning of the year, average price of acquisition during the year, or prices of acquisitions

"Lifo" Computation with 1957 Increment Priced at First Acquisition Level

	Total
12/31/57 inventory at cost ("fifo")	$132,353
1957 "lifo" index	106.18%
12/31/57 inventory at 1/1/57 price level	$124,649
12/31/56 inventory at 1/1/57 price level	96,020
1957 increment due to change in quantity (at 1/1/57 price level)	$ 28,629
1957 increment at first acquisition level - 102.26% of 1/1/57 price level	$ 29,276
1957 inventory at basis (1/1/56) price level	92,544
1957 inventory at "lifo"	$121,820
1957 inventory at cost ("fifo")	132,352
"Lifo" reserve required	$ 10,532
"Lifo" reserve per books	3,476
Adjustment required	$ 7,056

EXHIBIT 4

at the end of the year may be used. Once the taxpayer has reached a decision, he has to be consistent from year to year in pricing increments. The economic changes during the year were reviewed and it was noted that prices increased steadily during the year and that most benefit could be obtained by using the earliest acquisitions.

First acquisitions for the most active items in the inventory were listed, along with their cost. A sufficient number of items were listed, so the total cost of these items exceeded that of the 1957 increment. These items were priced at the January 1, 1957 price level and an acquisition index was developed in the same manner as price index for the start and close of the initial year. This index of 102.26 percent was applied to the $28,629 and resulted in a 1957 increment valuation of $29,276. The December 31, 1957 inventory at "lifo", then, was the $92,544 base layer figure computed in 1956 plus the 1957 increment of $29,276. After comparing this total of $121,820 to the closing 1957 inventory value at "fifo" of $132,352, a reserve of $10,532 was required. Since a reserve of $3,476 was recorded in 1956, an additional $7,056 adjustment was made at December 31, 1957.

Liquidation in 1958 of Portion of Base

The application of the dollar value method of "lifo" valuation would not be complete without an example of a liquidation. The inventory at December 31, 1958 ("fifo") was $92,177. As can be seen by Exhibit 5, a reduction in this inventory value to the prices prevailing at the beginning of the year is required. As before, the computed price level index is applied. In comparing the year-end 1958 inventory value (at the beginning price level) to the December 31, 1957 inventory (at that level), a decrease of $42,363 is noted. After reducing the inventory by that amount to arrive at the value prevailing at January 1, 1957, the entire increment of 1957 has been liquidated. Therefore, the balance of $11,268 (at January 1, 1957 price level) has to be reduced in value to the price level of the year before. The reduced figure of $10,860 is now at its original cost and is deducted from the base level inventory. As can be seen from Exhibit 5, the reserve required is $10,492, only $40 below the reserve required in the prior year. This minor reduction in the reserve, while there is a substantial reduction in the inventory, is because the quantity at the base level has felt the cumulative effect of all price increases. The base level was not materially affected by the reduction in inventory.

"Lifo" computations are subject to review and approval by the Internal Revenue Service. Adjustments may be required in the method of computing

the "lifo" inventory, before the Internal Revenue Service will accept the change. The Service has been reasonable in accepting taxpayers computations; all that is required is a sound logical approach to the situation.

Paper - "Lifo" Computation

December 31, 1958

12/31/58 inventory at cost ("fifo")	$ 92,177
1958 "lifo" index	102.43%
12/31/58 inventory at 1/1/58 price level	89,990
12/31/57 inventory at 1/1/58 price level	132,353
Change due to decrease in quantity - 1/1/58 price level	$ (42,363)
1957 "lifo" index	106.18%
Change due to decrease in quantity - 1/1/57 price level	$ (39,897)
1957 increment at 1/1/57 price level	28,629
Liquidation of base stock at 1/1/57 price level	$ 11,268
1956 index	103.76%
Liquidation of base stock at 1/1/56 price level	10,860
Basic "lifo" inventory	92,544
1958 inventory at "lifo"	$ 81,685
1958 inventory at "fifo"	92,177
"Lifo" reserve required	$ 10,492
"Lifo" reserve per books	10,532
Adjustment needed	$ (40)

Note:
Exhibits 3, 4, 5 are presented in detail. Ordinarily a permanent schedule is prepared to carry forward from year to year the details of the computations.

EXHIBIT 5

Should "Lifo" Be Adopted Now?

Many well-known economists believe that we have a built in inflation factor in our economy and that the inflation curve will be rising steadily and slowly over the next ten years. If these economists are correct in their thinking, current adoption of "lifo" merits study by business management.

At the beginning of 1950, out of 600 survey companies listed in the Accounting Trends and Techniques[1], 118 companies referred to "lifo" in their annual reports. At the end of 1957, the number of companies using "lifo" increased

[1] *Accounting Trends and Techniques*, Twelfth Edition, 1958, American Institute of Certified Public Accountants, p. 53.

to 204. Two of the larger companies adopting "lifo" in 1957 were Chrysler Corporation and R. J. Reynolds Tobacco Company. Chrysler Corporation adopted "lifo" for substantially all United States inventories. Because of this change, inventories at December 31, 1957, were stated approximately $10,000,000 lower than they would have been under the former method, and net earnings for 1957 were reduced approximately $5,000,000. R. J. Reynolds Tobacco Company adopted "lifo" for its entire inventory. Such change had the effect of reducing the amount stated for inventories at December 31, 1957, by $28,312,684, and reduced the net earnings by $12,342,049. As indicated by these figures, the matching of current costs to current sales has eliminated from inventory a fictitious profit that would have been present if "fifo" or average cost had been used. In the author's opinion these decisions to adopt "lifo" were sound and present valid evidence of the trend in favor of the adoption of "lifo".

Inventory Cost Allocation Practices and Concepts

by OSAMU NISIZAWA

IN THIS ARTICLE I shall present the results of my survey on the problem of how manufacturing companies in the United States are now apportioning their costs between product and period costs, and then arrive at the inventory cost concepts which seem to underlie their current accounting practices as determined from the survey.

Objective and Procedures of the Survey

General principles applicable to the pricing of inventories of mercantile and manufacturing enterprises, as set forth by Accounting Research Bulletin No. 43 issued by the Committee on Accounting Procedure of American Institute of Certified Public Accountants, are:

> "The primary basis of accounting for inventories is cost, which has been defined generally as the price paid or consideration given to acquire an asset. As applied to inventories, cost means in principle the sum of the applicable expenditures and charges directly or indirectly incurred in bringing an article to its existing condition and location."[1]

It continues to discuss the content of inventory costs: "Although principles for the determination of inventory costs may be easily stated, their application, particularly to such inventory items as work in process and finished goods, is difficult because of the variety of problems encountered in the allocation of costs and charges."[1]

Although the above mentioned statement and related discussion make it clear that inventory costs in manufacturing enterprises include the general and administrative expenses related clearly to production but exclude abnormal manufacturing expenses and all selling costs, they do not describe what kind

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[1] *Restatement and Revision of Accounting Research Bulletins*, American Institute of Certified Public Accountants, 1953, p. 28.

of cost items should be included in inventories. Thus, the practical determination as to which cost items are to be included in inventories is left to the management's decision in individual companies. Therefore, it will be surely of interest to managements, as well as to other interested parties, to gain insight into the inventory cost concepts which leading manufacturing companies follow, as disclosed through a field survey on current cost accounting practices in these companies. This is the main objective of this study.

In order to achieve this objective, the method of mail questionnaire was selected as the basic survey method and the following problems were carefully considered before questionnaires were sent to the surveyed companies:

1. What kinds and what number of companies should be surveyed?
2. How should cost items be classified for this survey purpose?
3. What kind of questionnaire forms should be used?
4. With what data should this survey results be compared?

First of all, the 100 largest industrial corporations in 1957 were chosen as the participating companies in this survey from the list in "The Fortune Directory—The 500 Largest United States Industrial Corporations." (*Fortune*, July 1958, pp. 131-134). The total sales in these 100 companies were $128 billion, which is about forty percent of total sales of $323 billion for the 132,835 manufacturing companies in the United States; consequently, I believe, some generalizations can be drawn from the survey results on the above companies notwithstanding the limited number of surveyed companies.

As to the cost classifications, all costs and charges in the manufacturing companies were classified as follows for the survey purpose.

I. Manufacturing costs:
   A. Production department costs.
   B. Service department costs:
      a. Production support departments (e.g. power, water and repair departments).
      b. Plant administrative departments:
         1. Cost department
         2. General accounting department
         3. Purchasing department
         4. Timekeeping
         5. Personnel department
         6. Payroll department
         7. Inventory control
   C. Special manufacturing categories:
      a. Research and development costs
      b. Royalties paid

c. Standard cost variances:
   1. Material and labor variances
   2. Burden variances
      (a) Under-absorbed burden balances
      (b) Over-absorbed balances

d. Inventory cost adjustments:
   1. Adjustment to "lower of cost or market"
   2. Write-offs for shortages and obsolescence, etc.
   3. Adjustment to new standard costs

II. Distribution costs:

A. Order-getting costs
(e.g. advertising costs, sales promotion costs, direct selling costs, and marketing administrative costs).

B. Order-filling costs:
   a. Costs of physical handling:
      1. Costs of packaging products:
         (a) When products are packaged as manufactured
         (b) When products are packaged for shipment
      2. Shipping department costs:
         (a) At factory
         (b) At field warehouses
      3. Costs of storing finished products:
         (a) When goods are stored at factory
         (b) When goods are stored at field warehouses
      4. Costs of transportation to field warehouses
      5. Costs of interdivisional shipments:
         (a) Interfactory transportation
         (b) Interfactory storage
   b. Clerical costs of marketing
      (see section I B b)

C. General administrative costs:
   a. Salaries of top executives
   b. Other administrative costs

III. Non-operating costs
(e.g. interest expenses, amortization of certain deferred expenses and loss from sales of securities).

IV. Net income deduction
(e.g. federal and state income taxes).

The questionnaire forms were designed to be answered only by placing check marks in order to collect the research data as objectively as possible.

N.A.C.A. Research Series No. 10, "Costs Included in Inventories" (*N.A.C.A. Bulletin*, Section 3, August 15, 1947) was chosen as the data against which this survey would be compared. As the similar terminologies to those in Re-

search Series No. 10 were used in this questionnaire as often as possible, I feel confident that the present survey results can be usefully compared with 1947 survey results.

The questionnaires for the present survey were sent by mail to the comptroller or treasurer of the participating companies on November 1, 1958, and were returned by seventy-five companies through December 31, 1958. Summarization was done early in 1959. As ten companies of the seventy-five answered the questionnaires incompletely, the replies by the remaining sixty-five companies are used in this study as basic materials.

There are some differences in number of the reporting companies between the N.A.C.A. survey (here called the 1947 survey) and the present survey (here called the 1958 survey). Therefore, all data by both surveys will be shown in the form of percentages, in order to remove these differences.

Apportionment Practices; Product or Period Costs

Costs of Physical Handling. The accounting practices for treating physical handling costs are charted on Exhibit 1. The results of both the 1958 and 1947 surveys are shown by vertical bars for each cost item. The dark section on each bar represents the percentage of the companies charging the surveyed cost items to product costs; the shaded section represents the percentage of the companies charging the survey cost items to period costs; and the dotted section represents the percentage of the companies dividing their costs between product and period costs. (The same methods of graphic representation are used on other exhibits.) The following characteristics of treating costs of physical handling are summarized from Exhibit 1:

A. Costs of packaging products when goods are packaged as manufactured are charged to product costs by over 90 percent of the participating companies in both surveys.

B. Interfactory transportation and interfactory storage costs, that is, interdivisional shipment costs, are charged to product costs by about 70 percent of the participating companies in both surveys.

C. Shipping department cost at field warehouses and cost of storing finished products at field warehouses are charged to period costs by over 85 percent of the participating companies in both surveys.

D. Roughly speaking, other costs of physical handling, that is, costs of packaging products when goods are packaged for shipment, shipping department costs at factory, costs of storing finished product at plant and costs of transportation to field warehouses are charged to product costs by half of the participating companies, and to period costs by another half of above companies in both the 1958 and 1947 surveys.

EXHIBIT 1

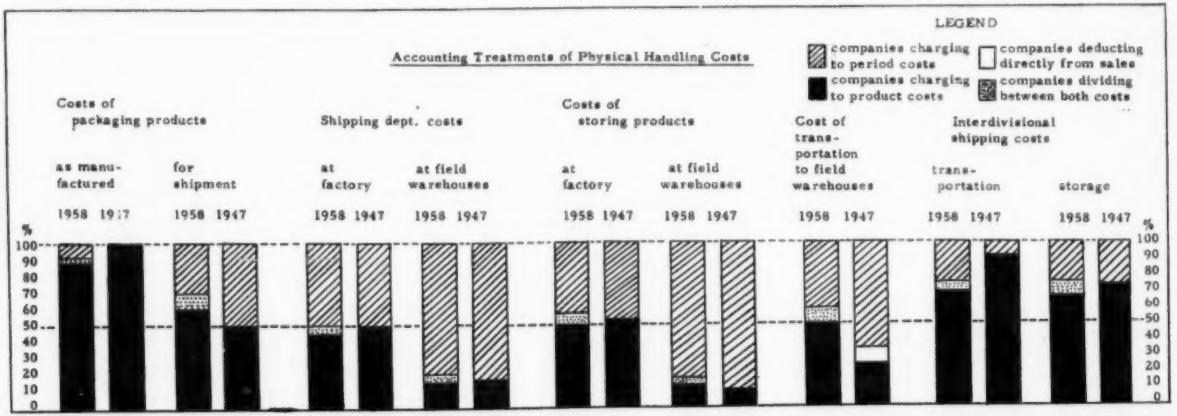
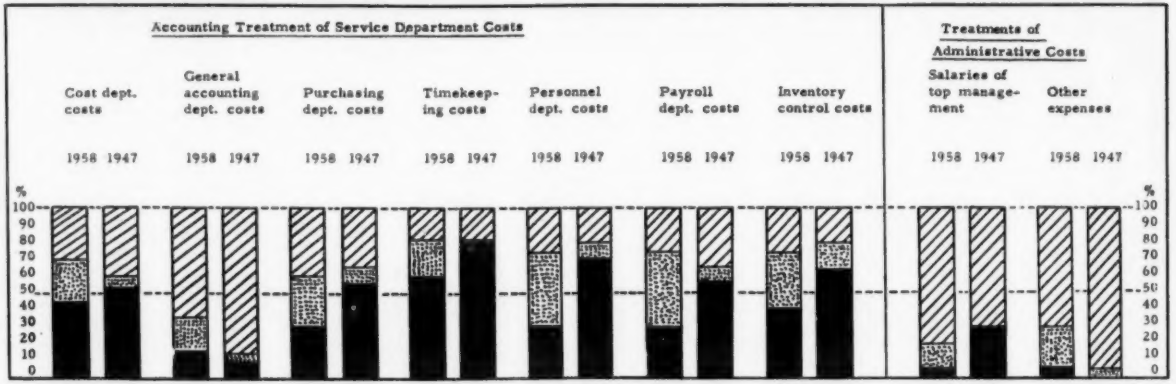


EXHIBIT 2



Comparing the 1958 survey results with the 1947 survey results, it is notable that they show almost the same results in spite of the fact that the surveys were carried out with different companies and in different years. This seems to mean that uniformity of treating the costs of physical handling exists among the manufacturing companies and that accounting practices in this field have undergone no essential changes during these eleven years.

Further investigation of above data reveals that most of the participating companies divide their costs between product and period costs on the basis of the organizational places at which their costs are incurred. It is very interesting that the apportionment practices are influenced neither by types of natural costs (e.g., salaries, insurance, or depreciation) nor by types of functional costs (e.g., packaging, storage, or transportation costs) but by types of business segment costs (e.g., shipping costs at factory or field warehouses).

This trend is indicated by the fact that most of the participating companies charge the costs incurred within the manufacturing process proper to product costs, while the costs incurred at field warehouses are charged to period costs. However, there is no such uniformity on the costs incurred between the manufacturing processes and field warehouses (e.g., packaging costs for shipment, shipping and storage costs at factory, and transportation costs to field warehouses). These costs seem to be charged to product costs when top managements consider the corresponding operations an inseparable part of the manufacturing processes, but to period costs when considered a part of the subsequent processes of distribution.

Service Department Costs (plant administrative department costs). From Exhibit 2 the following characteristics can be pointed out.

The 1958 survey results:

1. General accounting department costs are charged to period costs and timekeeping costs to product costs by 65 percent of the participating companies.
2. Very broadly speaking, other service department costs are charged to product costs by one third of the participating companies, to period costs by one third of the companies, and divided between product and period costs by the remaining one third of the companies.

The 1947 survey results:

1. General accounting department costs were charged to period costs by 90 percent of the participating companies.

2. Cost department costs and purchasing department costs were charged to product costs by more than 50 percent of the companies.
3. Other service department costs (i.e., timekeeping costs, personnel department costs, payroll department costs and inventory control costs) were charged to product costs by almost 70 percent of the companies.

Comparing the 1958 survey results with the 1947 survey results, the percentage of the companies dividing between product and period costs have increased remarkably. In both surveys general accounting department costs are charged to product costs by most of the participating companies, while timekeeping costs are charged to product costs by most of the companies. All other service department costs, that is, cost department costs, purchasing department costs and inventory control costs show similar situations when the percentages of the companies charging these costs to product costs, the percentages of the companies charging them to period costs, and the percentages of the companies dividing them between product and period costs, are brought together for comparison. Different treatments seem to result from the facts that the nature and condition of service departments are different from company to company. For example, companies with service departments located at the plant which serve only the plant charge the service department costs to product costs, while companies with service departments located at home office which serves both the plant and home office divide service department costs between product and period costs. On the other hand, to the companies which charge service department costs to period costs, the convenience of computation may take priority because of the small amount of the service department costs.

General Administrative Cost. The last four bars on Exhibit 2 show the treatment of general administrative costs, which include salaries of top executives and other administrative costs. Some characteristics are summarized as follows:

A. Salaries of top executives and other administrative costs are charged to period costs by over 70 percent of the participating companies in the 1958 survey.
B. Salaries of top executives and other administrative costs are divided between product and period costs by 15 to 20 percent of the participating companies in the 1958 survey.
C. The difference in treatments, found between salaries of top executives and other administrative costs in the 1947 survey, has disappeared and both treatments became nearly equal in the 1958 survey.

According to N.A.C.A. Research Series No. 10, the companies which charge general administrative costs to period costs follow the view that "administration is a separate function coordinated with manufacturing and selling. Since inventories are, by well established custom, composed of costs of manufacture rather than total costs of running the business while the goods are being made, administrative costs are usually treated as period costs."[2] The companies which divide general administrative costs between product and period costs, follow the view that "two primary functions of operating a business are manufacturing and selling, and the administrative costs are really incurred for the benefit of these two functions,"[3] so that the companies "include in manufacturing costs (and inventories) an appropriate share of the general and administrative costs."[4] The above data indicates that companies following the former way of thinking prevail in number to those following the latter way of thinking.

Special Manufacturing Categories. Apportionment practices of these costs between product and period costs are charted on Exhibit 3. From this exhibit, some characteristics can be pointed out as follows:

RESEARCH AND DEVELOPMENT COSTS

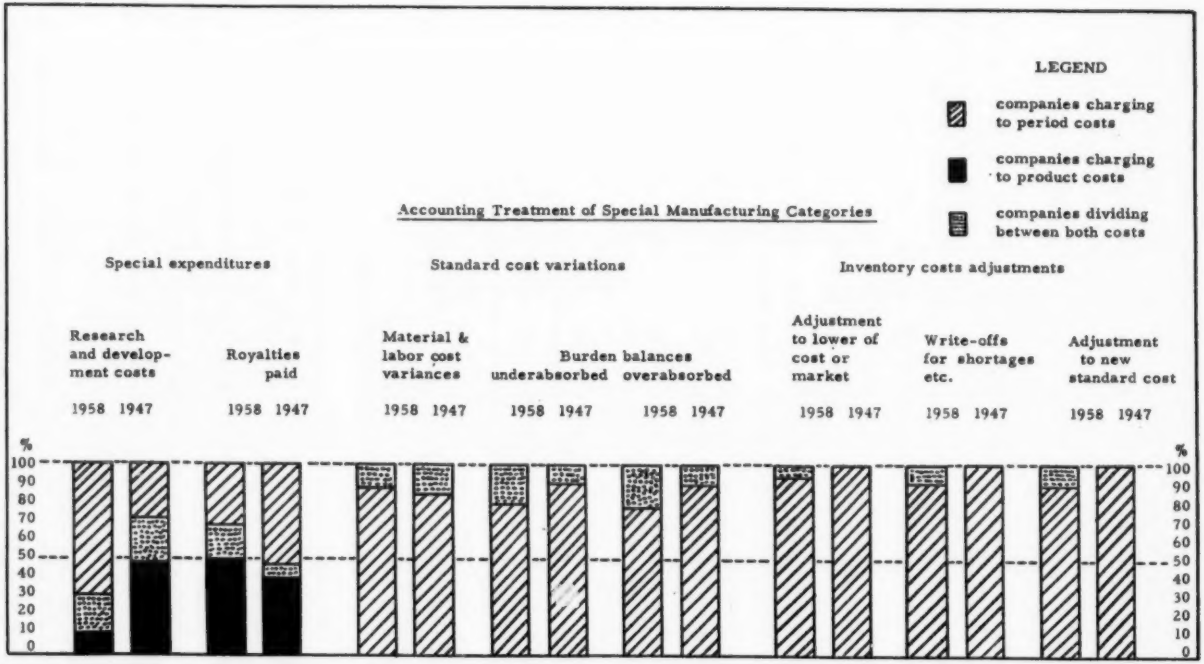
1. Research and development costs are charged to period costs by 70 percent of the participating companies in the 1958 survey.
2. Research and development costs are charged to product costs by only 10 percent of the companies in the 1958 survey.
3. The 1958 and 1947 surveys show almost opposite results.

It is especially interesting that the companies charging the costs to period costs in the 1958 survey have increased by about two and a half times as compared to those in the 1947 survey. This remarkable change seems to have resulted from the revision of Internal Revenue Code in 1954. Section 174 in the Internal Revenue Code of 1954 describes the general treatment of research and experimental expenditures as follows:

> "A taxpayer may treat research or experimental expenditures which are paid or incurred by him during the taxable year in connection with his trade or business as expenses which are not chargeable to capital account. The expenditures so treated shall be allowed as deduction." [(a) (1) of SEC 174, Research and Experimental Expenditures, *Internal Revenue Code of 1954* (83rd Congress — 2nd Session, H. R. 8300)].

[2] *N.A.C.A. Research Series No. 10,* op. cit., p. 1593
[3] *Ibid.*, p. 1594.
[4] *Ibid.*, p. 1594.

EXHIBIT 3


LEGEND
companies charging to period costs
companies charging to product costs
companies dividing between both costs
Accounting Treatment of Special Manufacturing Categories
Special expenditures
Standard cost variations
Inventory costs adjustments
Research and development costs
Royalties paid
Material & labor cost variances
Burden balances underabsorbed
Burden balances overabsorbed
Adjustment to lower of cost or market
Write-offs for shortages etc.
Adjustment to new standard cost
1958 1947
%
100
90
80
70
60
50
40
30
20
10
0

This method can be adopted by a taxpayer, without the consent of the Secretary or his delegate, in each taxable year which begins after December 31, 1953. Therefore, most of the participating companies have changed their policies to charging of research and development costs to period costs. Otherwise, the companies must treat the costs as deferred expenses and amortize them over a period not shorter than 60 months.

As the other two N.A.C.A. Research Reports in this field,[5] have stated, several other factors (e.g., the objectives of research and development activities and the amount of research and development expenditures) will, of course, influence the apportionment practices of research and development costs.

ROYALTIES PAID

1. Royalties paid are charged to product costs by about 50 percent of the participating companies in the 1958 survey.
2. Royalties paid are charged to period costs by about 30 percent of the participating companies in the 1958 survey.
3. The percentage of the companies dividing royalties paid between product and period costs has increased as compared with that in the 1947 survey.

Royalties paid are usually classified into two categories: royalties paid on the basis of use of machinery, materials, manufacturing process, or units produced, and royalties paid on the basis of units sold or dollars of sales. Generally speaking, the former kind of royalties paid may be charged to product costs, while the latter kind of royalties paid may be charged to period costs (costs of goods sold).

STANDARD COST VARIANCES

1. All standard cost variances are charged to period costs (costs of goods sold or profit and loss) by about 80 to 90 percent of the participating companies in both the 1958 and 1947 surveys.
2. All standard cost variances are divided between product costs and period costs (costs of goods sold or profit and loss) by about 10 to 20 percent of the companies in both surveys.
3. No participating company in either survey charges standard cost variances to product costs only.

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[5] a. "Present Day Practices in Accounting for Research and Development Costs", *N.A.C.A. Research Study, N.A.C.A. Bulletin*, Section 3, March 1, 1939.

b. "Accounting for Research and Development Costs", *N.A.C.A. Research Series No. 29, N.A.C.A. Bulletin*, Section 3, June 1955.

N.A.C.A. Research Report, "How Standard Costs Are Being Used Currently," *(Complete N.A.C.A. Standard Cost Research Series,* pp. 59-60) reports the following data on standard cost variances. (The data below are partly modified by the author.)

	Percent of Companies		
	Material quantity variances	*Labor variances*	*Burden variances*
Variances treated as period costs	78	82	84
Variances divided between product costs and period costs	22	18	16
Total	100%	100%	100%

The above figures show the almost identical results as those in Exhibit 3. Therefore, it can be assumed that standard cost variances are charged to period costs (costs of goods sold or profit and loss) by most of the manufacturing companies. One of the reasons why the companies follow such practices is that they have the view:

> "One of the principal concepts underlying standard costs is that variances represent costs of waste and inefficiency, and as such should be excluded from costs of the goods manufactured." (N.A.C.A. Research Series No. 10, *op. cit.,* p. 1599.)

INVENTORY COST ADJUSTMENTS

1. All of inventory cost adjustments (i.e., adjustments to lower of cost or market, write-offs for shortages, etc., and adjustments to new standard costs) are charged to period costs by over 90 percent of the participating companies in the 1958 survey.
2. All of inventory cost adjustments are charged to period costs by all of the participating companies in the 1947 survey.
3. No participating company in either survey charges inventory cost adjustments to product costs only.

Adjustment of inventories to lower of cost or market, inventory write-offs for shortages and obsolescence, etc., and adjustment of inventories to new standard costs are usually made at the end of the accounting period and have no definite relationship with manufacturing activities proper, so that most of the participating companies will apply these adjustments directly against income of the period without assignment to inventories.

Tentative Inventory Cost Concepts

In the foregoing pages, our attention has been primarily directed at those cost items which lie near the boundary line between product and period costs. Apportionment practices of these costs have been summarized on the basis of the information which the participating companies in both the 1958 and 1947 surveys reported.

It is one of the most outstanding findings of the 1958 survey that its results show almost the same survey results as those in the 1947 survey, except that the companies dividing cost between product and period costs have increased to some extent, especially in the treatment of service department costs.

In conclusion, let us list the inventory cost concepts which the participating companies seem to follow in their accounting practices. Of course, it is unnecessary to say that these concepts are based on the information given by 65 of the largest industrial companies in the United States, so that it may only be conjectured as to how these concepts apply to the other companies. Nevertheless, I believe that it is of value to try to restate the inventory cost concepts of the participating companies in the 1958 survey.

Concept 1. Production department costs and production support department costs are usually charged to product costs.

Concept 2. The physical handling costs incurred with the manufacturing process proper tend to be charged to product costs. However, accounting treatments of the physical handling costs incurred between the manufacturing processes and field warehouses or sales branches seem to be different from company to company.

Concept 3. As to plant administrative department costs, general accounting department costs are apt to be charged to period costs and timekeeping costs to be charged to product costs by many companies. Other plant administrative department costs seem to be, very broadly speaking, charged to product costs by one third of the companies, charged to period costs by one third of the companies, and divided between the product and period costs by the remaining one third of the companies.

Concept 4. General administrative costs are not usually charged to product costs, except in companies which regard administrative costs as really incurred for the benefit of both the manufacturing and selling functions.

Concept 5. The companies charging research and development costs to period costs have remarkably increased because of the revision of Internal

Revenue Code in 1954. Those royalties which are paid on the basis of use of machinery, materials, manufacturing process, or units produced, tend to be charged to product costs.

Concept 6. Standard cost variances and inventory cost adjustments are not usually charged to product costs by most of the manufacturing companies.

Concept 7. Order-getting costs, nonoperating costs and net income deductions are not charged to product costs under the usual conditions.

Beyond these Covers

Books

Accounting Trends and Techniques

American Institute of Certified Public Accountants, 270 Madison Avenue, New York 16, N. Y. Thirteenth Edition, 1959, $18.

This now-established guide to financial statement practice offers, as in earlier editions, information and conclusions from study of financial reports of 600 industrial companies. Sections of the study deal with the financial statements as a whole, the balance sheet, income statement, retained earnings and capital surplus, and auditors' reports.

Budgetary Control

Organization for European Economic Cooperation, 1346 Connecticut Avenue, NW, Washington 6, D. C. Paper Bound, 1959, 65 pp., $1.

The subtitle of this study is "An Effective Tool for the Management of Small and Medium-Size Enterprises." It was prepared by T. Bak Jensen of Denmark and resulted from the OEEC'S Project 172 which comprised a "series of conferences and seminars on budgetary control". Control of variable cost, short-term budgeting, and (more briefly) long term budgeting are considered.

Institute on Accounting

Ohio State University Publications, Columbus, Ohio, Paper Bound, 1959, 144 pp.

Gathered together in this publication of proceedings of the 21st Annual Ohio State Institute on Accounting are eleven papers on significant topics in the accounting and business field. Included are the following titles: "Controversial Areas Within Generally Accepted Accounting Principles", "The Great Depreciation Illusion," "Reporting Financial Data to Management, Stockholders and Employees", and "Rulings and Federal Taxes".

12th Annual Accounting Conference

Agricultural and Mechanical College of Texas, College Station, Texas, 1959, Paper Bound, 48 pp.

Reporting a conference held earlier in the year, these "proceedings" bring together ten addresses on topics of interest to accountants. Among the titles are "Allocation of Income Taxes", "Financial Reporting in an Inflationary Economy", and "Aids to Small Business Available Through the Small Business Administration."

Case Study on Audit of A Self Administered Union-Industry Welfare Fund

American Institute of Certified Public Accountants, 270 Madison Ave., New York 16, N. Y., Paper Bound, 1959, 23 pp.

Hypothetical statements accompany this description of auditing procedures relating to a welfare fund of the type now much in the public eye. Described also are the fund, itself, and internal control appropriate to it.

CPA Law Review

Joseph L. Frascona, Richard D. Irwin, Inc., Homewood, Illinois, Revised Edition, 1959, 942 pp., $10.80.

A field with parts of which all accountants are necessarily acquainted is covered here under the topic grouping of: Contracts, Personal Property, Negotiable Instruments, Agency, Business Organizations, Security, Bankruptcy, Insurance, Real Property, Estates, Trusts, and Administrative Law.

Working With the Revenue Code 1959

T. T. Shaw, Editor, American Institute of Certified Public Accountants, 270 Madison Ave., New York 16, N. Y., 1959, Paper Bound, 227 pp.

"The most helpful and pertinent items" (1954-59) from "The Tax Clinic" of the Journal of Accountancy are included in this volume, the index and text of which are cross-referenced to the Internal Revenue Code.

Office Management Handbook

Harry L. Wylie, Editor, Ronald Press, 15 East 26th Street, New York 10, N. Y., Second Edition, 1958.

The many topics which are treated by the section authors in this compendious manual box the compass with respect to office management and, in some respects, reach out to space. Salary administration, forms design, financial planning and clerical cost control are among the 21 titles and are of most relevance to accountants.

Conference Proceedings — N. O. M. A.

National Office Management Association, 1927 Old York Road, Willow Grove, Penna., 50¢ (See text below).

The August 1959 issue of the Office Executive is devoted to the 40th annual conference of the National Office Management Association, including "adaptations of conference talks." Titles of these include "The Administrative Revolution and Creative Management," "Program to Increase Office Production," "Office Machines: Solution or Problem," and "Making the Most of Your Pay Check" (on family finance).

Systems & Procedures Responsibility

Philip H. Thurston, Division of Research, Graduate School of Business Administration, Soldiers Field, Boston 63, Mass., 1959, Paper Bound, 110 pp., $2.50.

Based on a doctoral thesis this book is an exposition of "an administrative view of the division of responsibility between operating people and specialists for systems and procedures work." Implicit in the pages are attribution of current importance to the area of systems revision and installations.

Systems and Procedures

Victor Lazzaro, Editor, Prentice-Hall, Inc., Englewood Cliffs, New Jersey, 1959, 464 pp., $10.

The sixteen sections of this book are each individually authored and deal with many topics pertinent to the interests of accountants. Work simplification, work measurement, and records management are all included, as are company manuals, budgets and cost control, tabulating equipment in business, electronics in business and work sampling in the office.

Handbook of Automation Computation and Control (Vol. II)

Grabbe, Ramo, and Wooldridge, Editors, John Wiley & Sons, 440 Fourth Ave., New York 16, N. Y., 1959, $17.50.

The second volume of a three-volume work, this book is made up of contributions by some 40 specialists. As Volume I was basic and dealt with general mathematics and numerical analysis before proceeding to information theory etc., this volume is concrete in its exposition of computers and computer programing, together with principal uses.

Ideas for Management

Systems & Procedures Association, 4463 Penobscott Building, Detroit, Michigan, 1959, 440 pp., $16.

So titled, this volume presents the proceedings of the "11th International Systems Meeting" held in Buffalo in 1958 by the Systems & Procedures Association. Papers on business systems in other countries, on systems analysis and design, on communications, and on data processing are included.

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